VOLUME 29 NUMBER 13

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# The Journal

## OF THE AMERICAN DENTAL ASSOCIATION

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Fracture of Jaws—*Stumpf*

Vitamin C Therapy—*Radusch*

Discoverers of Anesthesia—*Soifer*

"Key Ridge" as Diagnostic Aid—*Weingart*

Proximal Surfaces of Teeth—*Blayney et al.*

Pulp Capping in Deciduous Teeth—*Rosenstein*

Periodontic Problems in Children—*Blackstone*

Dentistry as a Health Service—*Holliday*

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# FORTY MINUTES OF COMPLETE DENTURE CONSTRUCTION

By BERT L. HOOPER, D.D.S., Lincoln, Nebr.

HOW can we improve our denture service? How can we improve this picture? A patient comes into the office the day following the insertion of his artificial dentures. His facial expression signifies dissatisfaction. His verbal utterances are in agreement with his looks. He is very unhappy.

Several things flash through our mind: impressions, jaw relation, esthetics, laboratory procedures, occlusal balance, final inspection. All these had received utmost care during construction; and when these dentures left the office yesterday, we were certain that they would give satisfactory performance.

But something has failed; something, somewhere in our denture service needs improvement.

Another patient enters the office, with "Well, Doctor, I don't think there is any need for me to be here today, but you said to come in. I'm thrilled with my new dentures; every one who has seen me says they are beautiful and that my expression hasn't changed a bit. Of course, I still have difficulty in eating and I know my enunciation isn't perfect yet; but I realize that I must become adjusted to this new mouth arrangement. I'm sure that in a short time I'll be perfectly comfortable."

These dentures had received no more exacting care in construction than had those for the first patient. But these are successful dentures and very probably will continue so, while the first may never be entirely right.

What improvements can we make in our denture service so that all denture patients may return as did this second patient?

The answer, in my opinion, is: By creating in the minds of the general public a receptive attitude for denture service, instilling them with confidence that successful denture service is available for them, and that, with their cooperation, there is really nothing to fear.

In other words, we as a profession have not done and are not doing our duty in educating the dental public about artificial dentures. Many of the unhappy, dissatisfied denture patients are so be-

Read before the Section on Full Denture Prosthesis at the Eighty-Third Annual Meeting of the American Dental Association, Houston, Texas, October 30, 1941.

cause they were not sufficiently informed on the subject to be able to enter this phase of their lives with understanding and cooperation sufficient to assure a successful denture experience.

Many other persons are staying completely away from our offices because we have failed to give them sufficient information on the subject of modern den-

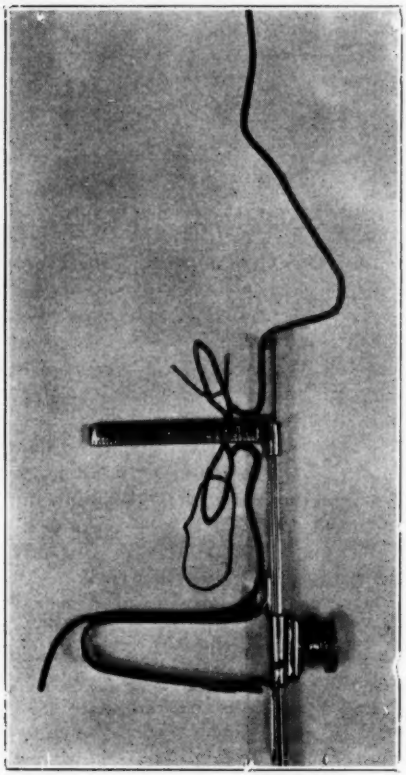

Fig. 1.—Instrument in position to obtain record of incisal teeth position. Upon its removal from the mouth, readings are taken for measurements from the nose to the incisal edge of the upper teeth and from the incisal edge of the lower teeth to the lower border of the chin.

ture service to eliminate their fears. They must be given confidence and courage to accept a denture diagnosis when necessary, instead of sitting back, procrastinating as long as possible, many of them harboring in their mouths an infection that is actually menacing their health and shortening their lives.

Mothers are being educated concerning prenatal tooth development and preventive care during babyhood. School children are given periodical examinations and regular class instruction in dental health. Adults are urged to see the dentist twice a year. Much, though still not enough, educational work is being

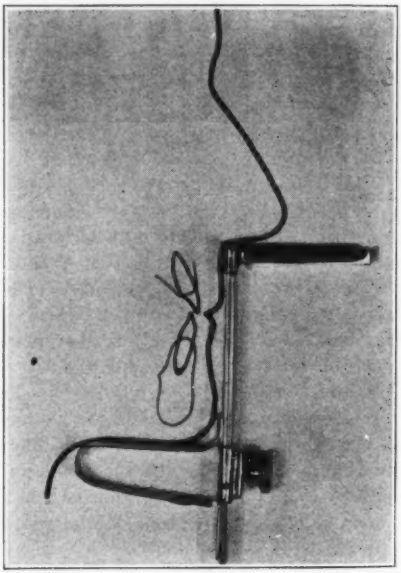

Fig. 2.—Instrument in position to obtain measurement from nose to lower border of chin.

done toward instructing the public regarding the care of the natural teeth. This is fine and should be continued and expanded to reach more people more forcibly and more frequently.

What dental educational information concerning artificial dentures is available to the general public?

Very little. This seems to be a subject to be shunned, not mentioned if it can be avoided. It is a subject which for many years has been associated with old

age; and, for some reason, none of us wants to grow old or be in any way associated with things which indicate age.

The satisfied denture patient, and there really are many, who has received good care and service and who might give other people good advice and information about artificial dentures refrains from mentioning the subject because he feels that his dentures are so nearly perfect that no one is aware of the substitution. And so, he reasons with himself, why advertise the matter?

Too many dissatisfied denture patients broadcast loud and long on their discomforts and troubles, a situation which only aggravates the seriousness of the profession's failure to provide adequate and authoritative advice.

We should take advantage of every opportunity to disseminate knowledge in order that the general dental public may know more about artificial dentures and the scope of the service that they entail. The information should not be limited entirely to denture patients who may come into our offices. When the occasion presents itself, any persons, young or old, should be shown some of those beautiful teeth that are being manufactured today. Let us call attention to the fine selection of shades and coloring, varying from the opaque to almost complete translucency, from the yellows to the grays, from the reds and orange to the blue tinges.

Let us point out the minute anatomic features of natural teeth that are incorporated in artificial ones; characteristics such as lines, abrasion, erosion or other defects which come into natural teeth through wear, usage and age. Let the visitor see the various makes, sizes and shapes that are furnished, mentioning the fact that teeth are made to harmonize in shape and size with the face and facial features, and that they also harmonize or blend with the coloring or complexion.

A few years ago, we had reason to be somewhat reluctant to show a sample artificial denture. They were not very artistic. They could not be, because there was such a limited selection of artificial teeth, and the dark rubber, or vulcanite, then used for bases certainly added nothing to a natural appearance or beauty. That type of denture is outmoded. Today, we proudly show dentures which really possess beauty and a natural appearance.

The newer acrylic base materials provide accurate simulation of mouth tissues. They are sightly and comfortable. They are by far the most sanitary materials that we have yet used.

Knowledge of some of these details of the intricate work involved in the construction of dentures will enhance the public's appreciation of denture service and, at the same time, give them confidence and courage to accept such service when it is prescribed for them. It will do much to banish the general public's mental picture of Grandma's false teeth, which could be found each morning in a cup of water near the kitchen sink, or of Granddad's plate, usually found on the clock-shelf, or of the denture of Aunt Minnie, who came home for a visit, but met no one who recognized her because of the change made in her by her new teeth.

More people would then be in a position to talk intelligently on the subject and it would not be taboo in general conversation. This change would soon eliminate any embarrassment and the idea that dentures are worn only by the old. It would become general knowledge that frequently people 16 to 20 years old are privileged to wear dentures when disease or accident has rendered their natural teeth useless. Instead of fearing and dreading artificial dentures, the public would learn to regard them as a boon to mankind, a marvelous substitute, far more desirable than disease, pain, disfigurement or discomfort.

A denture patient, aged about 40, recently stated that she had worn spectacles since she was 5 years of age and

that she had thanked God through all those years for oculists and for the improvement in her sight brought about by wearing glasses. Without them, she would have missed much during her entire life. That experience gave her a fine attitude toward wearing artificial dentures. She thought of the terrible calamity that it would be if there were no dentists and no artificial dentures possible for her. She greatly appreciated the work that was done and had no fear nor misgivings about the results. She had confidence and courage and gave her cooperation; and her dentures are truly satisfactory.

Our problem is to inspire more people with that confidence, courage and desire for cooperation and to dispel the older concepts that have been inherited through the years.

In telling the story of artificial dentures, either to a denture patient or to others who may come into our offices, a viewbox and some photographs on 35 mm. color film are often very effective. We can show the pictures of a few persons, some with natural teeth, some with artificial, and ask the patient to pick out those wearing artificial dentures. Seldom will he be able to do this correctly. This demonstration is usually quite effective, since most persons feel that they cannot be fooled when it comes to detecting artificial teeth. They begin to realize that each day they probably speak with any number of persons wearing artificial dentures which are so constructed that the natural teeth were imitated to an exact likeness and the substitution is not discernible.

Let us tell these visitors about the advantages of a series of photographs taken previously to the surgical procedure if the need for dentures is anticipated, mentioning that these pictures when made the actual size of the face, mouth and teeth may be used as a record of the natural facial dimensions and expression. Let us explain to them the value of this record in maintaining correct facial dimensions and personal characteristics through later years, explaining too the value of certain measurements which aid in preserving or restoring facial dimensions and the facial appearance.

The public is vaguely aware of the changes in facial expression, but many do not stop to consider just what causes the changes; and the dentures receive undue criticism.

We should impress upon them that such changes may occur almost immediately with artificial dentures of incorrect proportions; but, in the majority of cases, the changes have come by degrees, over a period of time. The artificial dentures probably were very well designed at the time of insertion, but through Nature's process of resorption of tissues, the vertical dimension of the face becomes shortened, tissues of the cheek sag, the lips are flattened and a generally aged appearance is evident.

The public sees these changes and, not knowing why they exist, or that they might have been avoided, or even now may be corrected, they blame the dentures, and again fear and dread are implanted in their minds.

Photographs of such cases, shown in the viewbox, will explain the situation to interested patients very vividly, and they will become cognizant of the scope of denture service that is available for them and for the dental public today. They will see the necessity for having dentures rebuilt or new ones constructed at intervals to retain the normal characteristics and personality. The preextraction records can be readily correlated for the restoration and maintenance of facial dimensions. Patients will become receptive to a prescription for dentures when they arrive at that point; and they will have been fortified with confidence, courage and a spirit of cooperation, which bespeaks efficiency, satisfaction and success, for them, for their dentures and for the dentist.

At this point, the attention is directed to an instrument which is helpful in ascertaining normal facial dimensions, an orientation gage. (Fig. 1.) The patient with natural teeth closes the incisors on the labio-incisal rule, as illustrated in Figure 1. The maxillary rule is moved into the arc formed by the nose and lip. The spring portion of the chin-rest is pressed to the line on the locking attachment, and the thumb-screw is tightened.

The readings on the labio-incisal rule are taken. The gage is removed from the mouth and the two readings for the distance from the incisal edge of the maxillary teeth to the nose and from the incisal edge of the mandibular teeth to the lower border of the chin are taken.

The instrument is readjusted and placed on the face with the teeth in occlusion. (Fig. 2.) The spring is pressed to the indicator line; the thumb-nut is tightened, and the reading is taken for the measurement from the nose to the lower border of the chin.

These measurements are then recorded for future use.

The use of this gage and the recording of these measurements impress the patient with the thoroughness of the dentist and aid greatly in rendering better denture service.

This type of record is most valuable when obtained before the natural teeth are removed, because it may be used to check the accuracy of an immediate denture and is of inestimable value when future rebuilding of the dentures becomes necessary.

For an edentulous case, when no preextraction records are available, no measurements, photographs, casts or other records having been obtained, the orientation gage may be used to record measurements taken a few days after the insertion of newly constructed dentures. These measurements then become the guide to the facial dimensions and may be used in later reconstructions of dentures when needed.

As mentioned previously, in addition to the advantages gained from having a definite record of facial dimensions for use in construction technics, this procedure, along with the taking of photographs and other preextraction details, does much to build up confidence in the dental public. They realize that denture service is a science and an art much broader and more intricate and detailed than they had before realized. Their interest and cooperation is awakened to a degree that makes for a receptive attitude toward their own denture diagnosis.

I might mention one more item which may spare the denture patients fear and dread. We should be especially careful not to incorporate in the denture the shrill, whistling sound that is often present. Whistles should never be allowed to develop, and they may be avoided or corrected if the patient and dentist cooperate. There is no set rule or definite pattern to eliminate the s-sound, but, in a majority of instances, it may be prevented by thickening the palate in the anterior region. However, there are a few cases that require a thicker palate in the posterior region.

In making the trial dentures, the palate is made with the usual thickness of trial baseplate material. The trial denture is inserted in the mouth and the patient is asked to count, starting with "sixty," and to repeat words, such as Mississippi, to determine the quality of tone or sound. If the s-sounds are shrill, an experimental procedure for correction is followed.

The palate may be thickened by one thickness of baseplate wax, starting lingually from the crest of the ridge behind the anterior teeth and extending back approximately in line with the first molars.

Another trial in the mouth is made, and if the S-sound is reduced, but is still too shrill, more wax is added in the same area, over that previously applied. If the second application of wax fails to

correct the sound, the wax is extended forward slightly.

Usually, the application of wax in this area makes the desired correction. By changing the position of the added wax and experimenting to find the position and the amount of thickness required, one may produce normal tones, minus the whistle.

If working in the anterior region fails to obtain the desired results, the added wax is removed and experiments are made in the posterior region.

In a recent case, it was necessary to increase the thickness of the posterior region 3 to 4 mm. before the whistle and shrillness of the s-sound was softened to a normal tone.

When the trial denture is satisfactory, rugae, which assist in softening shrill tones, are placed. In some cases, prominent rugae interfere with the tongue movements and require reduction. This is usually done by polishing with pumice.

If we eliminate all whistles from dentures, we will score again in helping to build confidence and courage and assure cooperation in the denture public.

At the present time, it appears to be a very crucial point in the life of Mr. John Q. Public when he begins his experiences with artificial dentures. This should not be so. If he had the right attitude toward this experience, if he had received from the dental profession the correct education, information, advice, concepts and ideas; if he had not been kept in ignorance of the artistic attainments, the scientific improvements and the possibilities of modern denture service, he would enter this phase of life with confidence, courage and a desire for cooperation, which bespeak satisfaction, efficiency, success and happiness in his denture experience.

It behooves the profession to consider this matter seriously, making a special effort to give authentic advice and informative publicity through various channels, and being careful to do this in an ethical manner.

In order to do this, and to eliminate the possibility of misunderstanding which might occur in oral explanations only, the booklet "Your New Teeth" may be found useful and effective. This gives, in concise statements, the principal points which need to be emphasized to denture patients. It may be handed to the patient as he leaves with his new dentures, or it may be given to him at an earlier appointment so that he may read it and be familiar with the instructions previous to completion of his dentures.

Many persons believe more in what they read than in what they hear. At any rate, this printed pamphlet permits them to read and reread the advice and instructions until they understand fully what to expect and how to proceed with the new dentures.

When patients read that they may have some discomfort, they realize what is expected, and that others have experienced similar discomfort, and certain adjustments are the usual routine procedure. They learn about cleaning the dentures and using them in eating and in speaking. There are illustrations of the effect of resorption of mouth tissues on the facial expression, so they can understand why future rebasing or reconstruction will be needed. They are told how the "old age expression" can be avoided. They understand why the public's idea that dental troubles are ended when satisfactory dentures are obtained is erroneous, continual change in the mouth tissues necessitating corrections in the dentures.

A receptive attitude is bred in them; confidence and understanding are instilled, and cooperation is assured. These are vital to the successful performance of artificial dentures.

1004 Sharp Building.

# THE "KEY RIDGE" AS A DIAGNOSTIC AID IN ORTHODONTICS

By M. Alden Weingart, D.D.S., New York, N. Y.

## INTRODUCTION

SINCE no one perfect method of diagnosis has been or is likely to be developed, it is difficult to discuss the value of the "key ridge" as a diagnostic aid without incorporating a discussion of diagnosis in general.

During the past fifteen years, orthodontic concepts and practice have undergone such a drastic renaissance as to leave the conscientious practitioner bewildered. Mechanical principles have been judiciously applied in the treatment of malocclusion. Satisfactory results have been obtained with various technical plans and adjustments, from the simple labial alinement wire to the lingual arch with auxiliary springs and the more intricate assemblages requiring the banding of all the teeth with various types of attachments.

However, we have frequently been confronted with the realization that identical technics and adjustments do not produce comparable results in apparently similar types of cases. The result has often been the discarding of a rational technical procedure and adoption of another type.

It is obvious, therefore, that the fault has been with methods of classification and diagnosis, which have been chaotic and are based upon empiricism and fallacious theories.

For years, we have depended on Angle's classification as a basis for diagnosis. However, in the light of present knowledge, this simple classification did not afford sufficient scope of application upon which to develop an adequate diagnosis of inherent malocclusion as related to surrounding structures.

Simon brought our attention to the fact that a diagnosis based solely upon clinical observation of occlusal relationships is totally inadequate. He presented a technic which, while having some

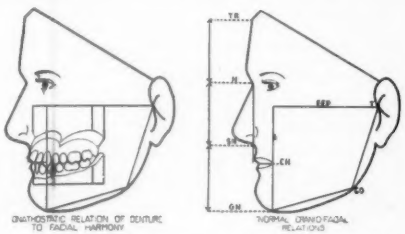


Fig. 1.—Basic concept of gnathostatic denture reproduction.

weaknesses, at least made us realize that a definite procedure must be adopted to orient the jaws and teeth to the rest of the head. Research by Broadbent, Todd and Brodie developed the value of the cephalometric roentgenogram and further convinced the more thoughtful student of orthodontics that the diagnostic technic must be elevated to a more scientific basis. And now Atkinson supplies the missing link in this diagnostic chain with the "key ridge," a valuable landmark which serves to supplement all the other data as a further check for accuracy.

It must be borne in mind, however, that no one method of diagnosis can be considered infallible or invulnerable, and

Read at the Fifth Annual Orthodontic Conference, under the auspices of the Graduate Division of the College of Dentistry, University of Southern California, August 5, 1941.

that since human judgment must be called upon to interpret our cases, we must take advantage of every known aid and employ every means that will assist us in these interpretations. After many years of experimentation and experience, I am convinced that a technic employing gnathostatic, photostatic and roentgenostatic data as herein described represents the best available practical means toward diagnostic accuracy in orthodontics.

### GNATHOSTATIC RELATION OF DENTURE TO CRANIOFACIAL HARMONY

In order to orient the denture in its relation to skull anatomy, a reproduction must be related to three planes of the head. These three planes, which give us aspects of height, width and length, stand at right angles to each other and are:

1. The Frankfort horizontal plane, which passes through the eye points (orbitalia) and the ear points (tragia).

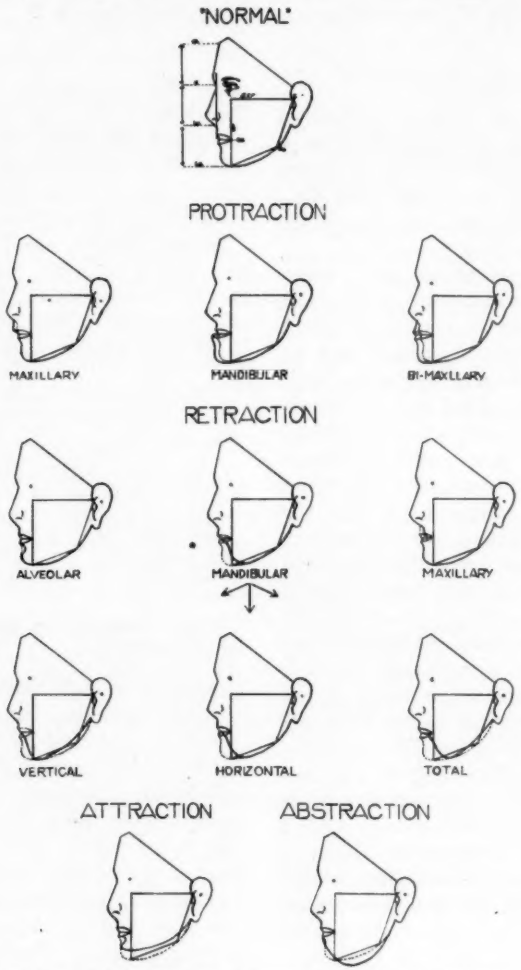


Fig. 2.—Deviations from "normal" craniofacial relations.

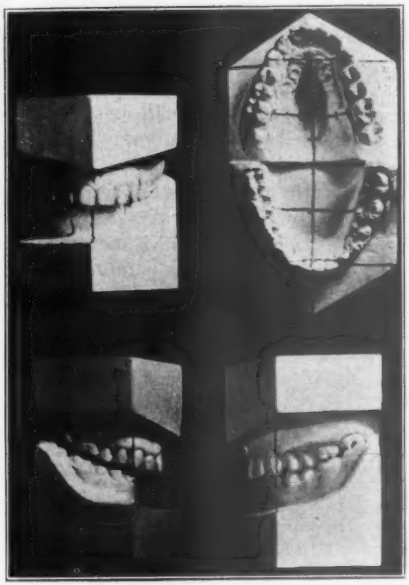

Fig. 3.—Gnathostatic denture reproductions properly scribed for diagnostic interpretation.

the eye points and stands perpendicular to the eye-ear plane.

The cephalometric landmarks used are the orbitalia, tragia and left gonion.

The orbital (eye) point is located on the lower bony margin of the orbit directly below the pupil of the eye.

The tragion (ear) point is the notch just above the tragus of the ear.

The gonial point is the point behind and below the angle of the jaw.

A study of Figure 1 will help to visualize these craniofacial landmarks. In the right illustration, it will be noted that the face is divided into three equal parts; that the corner of the mouth (chelion) and the gnathion lie in the orbital plane, and that the anterior curve of the chin is usually found to lie in front of the orbital plane. A vertical line drawn from the nasion parallel to the orbital plane will mark the point of the upper lip. The illustration on the left indicates the gnathostatic relation of the denture, and it will be noted that, in the "ideal norm," the orbital plane bisects the canine tooth. Any marked departure from these relationships is an indication that some

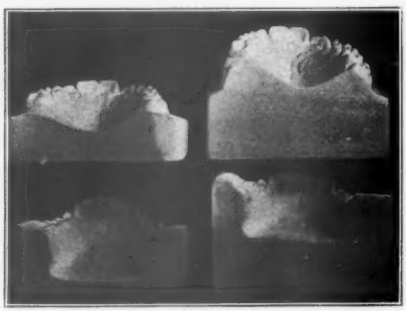

Fig. 4.—Denture reproduction in which gnathostatic models reveal marked asymmetrical development. This serious anomaly does not show in the unrelated models.

2. The median sagittal plane, which divides the head into two equal parts. It passes through the *raphe palati* and is perpendicular to the eye-ear plane.

3. The orbital plane, which intersects

morphologic deviation exists, the nature of which must be determined and analyzed.

Figure 2 graphically illustrates the several deviations that may be observed

in the photostatic and roentgenostatic pictures.

GNATHOSTATIC DENTURE REPRODUCTIONS

In the gnathostatic casts, we have a reproduction of the denture that is anatomic in its entirety to the three planes mentioned:

1. The upper base is identical with the eye-ear plane of the patient. The lower base is parallel to the upper.
2. The anterior angles of the bases coincide with the median plane.
3. The right and left angles correspond to the orbital plane.

With the casts oriented in this manner, a diagnostic study in relation to the three planes will reveal the following aspects:

1. From the median plane:
   (a) Transverse symmetry.
   (b) Arch form.
   (c) Proportion of width.
   (d) Inclination of tooth axis.
2. From the orbital plane:
   (a) Sagittal symmetry.
   (b) Anteroposterior relationship.
   (c) Inclination of tooth axis.
3. From the eye-ear plane:
   (a) Vertical dimension.
   (b) Form and angle of occlusal curve.
   (c) Inclination of tooth axis.

With the old-fashioned conventional models, which are merely reproductions of teeth without any relationship to skull structure, not only are these aspects obliterated, but also, in many cases, false representations of existing conditions are visualized, which doubtless prove misleading in many cases.

In Figure 4, it will be noted that the true anomaly of a marked asymmetrical development was lost in the conventional model. The technic of paralleling the occlusal plane with the base presents a

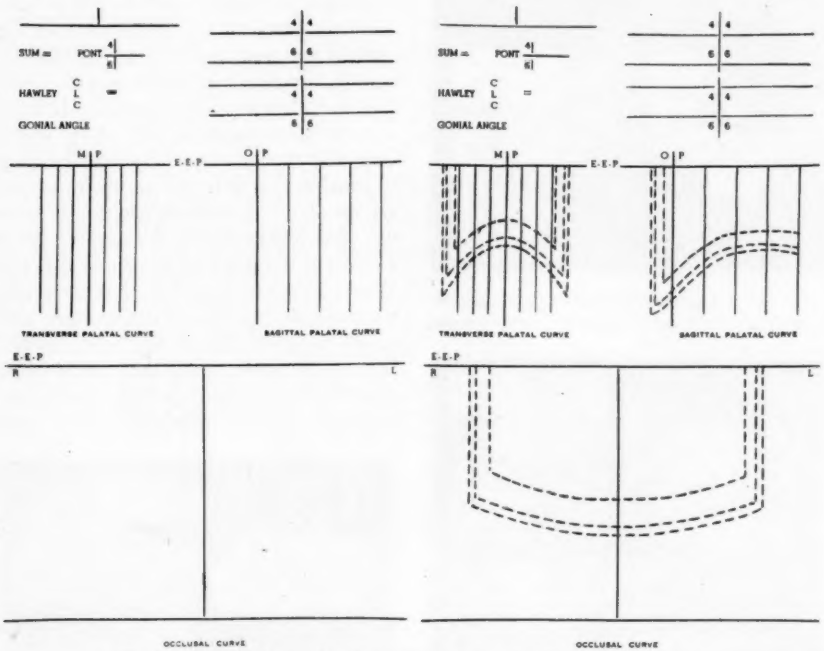


Fig. 5.—Graph charts showing norm patterns for 6, 12 and 18 years.

condition that is rarely found in Nature. As a matter of fact, the degree of angularity between the occlusal curve and the Frankfort horizontal plane is about 11 for the right side and 13 for the left side and is rarely the same on the two sides.

The diagnostic value of the gnathostatic models increases immeasurably when they are properly scribed with the aid of the Waldron symmetrograph and curve diagrams or graphs are prepared. These curves are superimposed over indicated norm patterns, which serve as a diagnostic guide similar to norm averages of weight, height, etc. Three norm patterns are used: 6, 12 and 18 years.

This procedure is of great value in compiling statistical data and, when similarly recharted upon the completion of treatment, offers conclusive evidence of the actual changes that have been achieved.

patient and they were cumbersome for filing purposes.

In the photostat, which is a photograph with the head positioned in the horizontal plane, we incorporate accuracy of detail with simplicity of reproduction and obtain a facial record which is of immense diagnostic value.

In Figure 6, we have a facial reproduction which supplements and is in harmony with, the orientation of the denture reproduction. When lines are drawn between the various cephalometric points heretofore mentioned, such a photostat is most helpful in analyzing and studying the features as they may vary from the average norm.

Fig. 6.—Photostatic facial reproductions with diagnostic planes indicated.

### THE PHOTOSTATIC RECORD

From the earliest days of orthodontics, photographs were used to record facial disharmony. That these unrelated photographs were of little diagnostic value is evidenced by the fact that they were discarded in favor of plaster masks. Their construction was too arduous for the

A fixed focal distance, either one-fourth or one-half life-size, must be established and maintained as a definite factor in the technic. When this is done, successive photostats of patients taken during treatment will have definite comparative value in studying growth changes resulting from treatment, particularly of the lower part of the face, the so-called "changeable area."

### THE ROENTGENOGRAPHIC RECORD

We now have reproductions of the denture and of the face which are re-

lated. A further record of dentofacial relations is obtained through the use of cephalometric roentgenograms of the head which show the orientation of the denture to the other facial osseous structures. Here again, the various anatomic landmarks are noted. It is now possible to take exact measurements from the various planes directly on the bone and thus overcome the weakness of taking measurements through the covering of soft tissues of unknown thicknesses. In this manner, the roentgenogram not only becomes a most valuable diagnostic aid, but, when taken serially, is also of inestimable value in studying and recording dentofacial developmental changes and checking the results of orthodontic treatment.

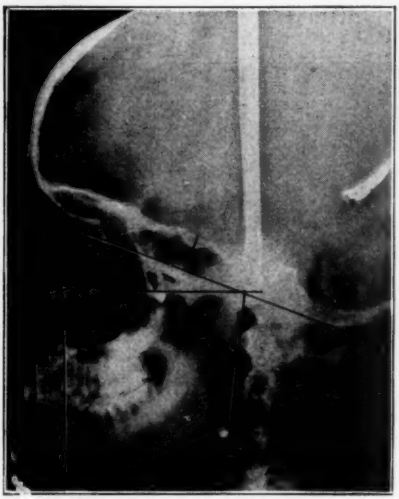

Fig. 7.—Profile roentgenogram showing cephalometric landmarks used to orient denture to facial osseous structures.

Since the orthodontist is primarily concerned with growth and development, during which period the eruption of teeth plays an important part, the necessity for an x-ray series of the individual teeth, together with lateral jaw views, as a routine procedure, needs no further comment.

A well-rounded diagnostic study should also include a roentgenogram of the hand of the developing child. This will afford a study of the epiphysis, the ossification centers, the degree of mineralization, etc. These roentgenograms are checked with the hand standards of Todd for normal skeletal maturation.

Fig. 8.—Roentgenogram of hand; used for studying skeletal maturation index.

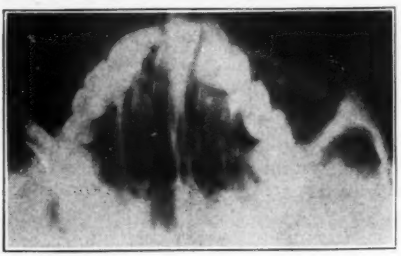

Fig. 9.—Maxillary roentgenogram which orients denture to "key ridge."

To complete the diagnostic study, it

is essential to predetermine the exact positioning of the individual teeth in the skull. It remained for Atkinson to give us this missing link in the diagnostic chain, the "key ridge," that strong buttress of bone which descends and goes forward from the zygoma to the maxillary bone and acts as a support for the maxillary first molar. In the adult, the ridge lies directly over the mesiobuccal root of the maxillary first molar.

A maxillary roentgenogram presents an excellent orientation of the denture to the "key ridge." This view affords not only a detailed study of the correct positioning of the teeth in the skull, but also an excellent study of arch form as related to the surrounding bony structures. In many instances, the posterior palatine suture is also visible, which offers an additional check for accuracy.

### DIFFERENTIAL DIAGNOSIS

With the foregoing gnathostatic, photostatic and roentgenostatic data at hand, a differential diagnosis of the denture, according to the three planes as established, is prepared:

A. Relation of the lateral halves to the median plane.

1. Contraction (Too near to the median plane).

2. Distraction (Too far from the median plane).

B. Relation to the orbital plane.

1. Protraction (anterior to normal).

2. Retraction (posterior to normal).

C. Relation to the horizontal plane.

1. Attraction (too close to the eye-ear plane).

2. Abstraction (too distant from the eye-ear plane).

Deviations are further classified as incisal, lateral and total, in horizontal localization. Vertical localization is designated as dental, alveolar, maxillary and mandibular.

Since it must be conceded that the denture is not an isolated body, but an anatomic and physiologic part of the head, it is not the intention of this presentation to elaborate further on the relative value of a diagnostic procedure based upon cephalometric investigations.

Contrary to many opinions, the preparatory technic is not an arduous one. With a little experience, the taking of the impressions will consume no more time than any other satisfactory impression technic. The laboratory procedure, in fact, takes even less time than the trimming of conventional models to artistic proportions; while the preparation of the graphs can be delegated to an efficient assistant.

Regardless of the time element involved, an appreciation of the value of a gnathostatic technic as the basis of a routine diagnostic procedure can be had only if one will adopt its principles in practice.

We are indebted to Ralph Waldron for his research and experimentation in this field. On his original technic, these procedures are based.

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# OSTEOMYELITIS OF THE JAWS*

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CERTAIN infections of the maxillofacial bones have been classified according to the location of the lesions: periostitis, inflammation of the surrounding membrane of bone or periosteum; osteitis, inflammation of the bone proper; osteomyelitis, inflammation of the medullary cavity. As the three classifications are so closely related, one affecting another, with no definite limits to the inflammation existing, differential diagnosis is difficult. Therefore, for the sake of simplicity, I shall use the term "osteomyelitis" to cover these classifications, its usage being common to the practitioner and it being generally applied to inflammatory conditions of a destructive process affecting the periosteum, the cortex and the marrow.

Osteomyelitis of the jaws is an ailment that may cause considerable anxiety and discomfort on the part of both the patient and the operator. It often means a course of prolonged, difficult treatment, with the possibility of serious complications. The condition may be minimized somewhat if it is recognized early enough and proper treatment is instituted immediately.

## BACTERIA

Gilmer and Moody, Rosenow and Haden have found that the principal organisms of suppurative inflammation are the various strains of streptococci and staphylococci. The streptococcus generally produces a rapid spreading infection, as it is not easily resisted by inflammatory reaction. It is often associated with *Bacillus fusiformis* and mixed infections. The hemolytic streptococcus is found more often in acute conditions, and *Streptococcus viridans* in the chronic stages. *Staphylococcus aureus* or *albus* is found to be more prevalent in localized abscesses. In this disease may also be found pneumococci, the diphtheroid bacillus, the tubercle bacillus, actinomyces, mixed organisms and the Vincent organism, these being mostly in the hematogenous group.

## ANATOMY

In order to clarify the undergoing changes caused by infection of the mandible, it is important to recall some of the normal anatomic structures of this bone. A cross-section of the mandible through the molar region will reveal two dense plates of compact bone, the cortical plates. These have small openings through which the bone receives nourishment from the periosteum. They inclose a soft cancellous structure consisting of slender lamellae and fibers running in four different directions. Between the latticework of these fibers are spaces containing marrow, which serve for the passage of blood vessels, lymphatics and nerves. Passing through the center of the mandible will be noted the mandibular canal, through which courses the inferior dental artery, which is the principal source of nourishment for the mandible, and the inferior dental nerve. The collateral circulation is obtained from the periosteal vessels which enter

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the cortical plates. A mental picture of this bone structure, with its limited blood supply, will disclose how easily an inflammation can cause a thrombus occluding the blood vessels that supply the bone, and resulting in death of that portion of the bone cut off. When the engorged vessels and inflammatory exudate are confined by the dense cortical plates, an intense pain results, more severe than inflammation of the soft tissue, which has elasticity. The mandible is involved by osteomyelitis about four times as often as the maxillae. The maxilla being flat and more porous, with a better blood supply, escapes much of the extensive involvement found in the mandible.

Fig. 1 (Case 1).—Marked destruction of bone, right mandible, with part of buccal plate destroyed.

ETIOLOGY

The principal causes of osteomyelitis are low resistance, the invasion of pathogenic organisms, a flare-up of chronic dental infections and other pathologic conditions about the teeth. Other causes are tooth extraction, usually during acute inflammation, fracture or other trauma, improper injection of procaine, breaking of needles, scarlet fever, influenza, typhoid fever, measles, diphtheria, chickenpox, smallpox, tuberculosis, syphilis, actinomycosis, radium treatment, vocational exposure to lead, arsenic, mercury or phosphorus and extreme temperatures. Osteomyelitis may be acute or chronic, and has also been grouped as localized or diffused. It is rather difficult to determine the exact classification in the acute stage, since the condition is based on extent of infection.

SYMPTOMS

Acute osteomyelitis of the mandible renders the patient quite toxic with an elevation of temperature and pulse rate, loss of appetite, a fetor of the breath, sensitivity and enlargement of the lymph glands, trismus of the involved muscles and difficulty of speech and swallowing if the lingual plate is involved. There is always an increase in the white cell count. Usually, there is a uniform swelling over the affected area. The patient complains of a deep-seated, violent bor-

ing pain throughout the jaw and extending to the ear. Often, the swelling of the face has been aggravated by hot external applications, which tend to spread the infection into the soft tissues. The extreme pain can be explained by the fact that the pus is confined under pressure by the cancellated structure of the bone. If teeth are present, they will loosen, with pus discharging from around the necks. The pus, unless released by surgical intervention, will bore through the cortical plate and form a subperiosteal abscess. If it is allowed to progress, invasion of the soft tissues will take place, and pointing externally with severe swelling. Palpation of the soft parts, which should be gentle, will detect fluctuation, a glossy, edematous appearance and discoloration signifying that infection is localized at this point. Roentgenograms taken at this time may not show any bone pathosis, nor should any x-ray evidence of bone change be expected for about two weeks. However, roentgenograms, if it is possible to secure them without too much discomfort to the patient, would reveal any impacted teeth, fractures, cysts, infected roots, etc. In the chronic stage of osteomyelitis, pain and swelling are greatly diminished from those symptoms in the acute condition.

Fig. 2 (Case 2).—Diffused destruction of bone from mental foramen region to the second molar, right mandible.

#### EXAMINATION

A complete history, with particular reference to recent infectious diseases, tuberculosis, syphilis, diabetes, traumatic injury, dental symptoms, the nature of recent dental relief, etc., is obtained. The temperature, pulse rate, blood count, coagulation, bleeding time, urinalysis, Wassermann, smear for Vincent's infection, classification of the chief organism and roentgenograms are secured and recorded. Dental defects are noted and the teeth are tested for vitality. The blood may be typed to be available if its need is indicated. In chronic osteomyelitis, roentgenograms are often the only source of information, the patient not being aware of the existing condition.

Often, cases have lain dormant for years without a flareup. Sometimes, in these old chronic cases, the patient experiences some noticeable symptoms in the nature of indefinite pains radiating to the ear or a dull, peculiar sensation in the involved region. Roentgenograms of these cases will usually disclose that the bone is carious; that is, it has a rarefied, moth-eaten appearance. On the other hand, the bone may show osteosclerosis, calcified areas. In these chronic conditions, there are no acute symptoms, nor is there definite exfoliation of sequestra.

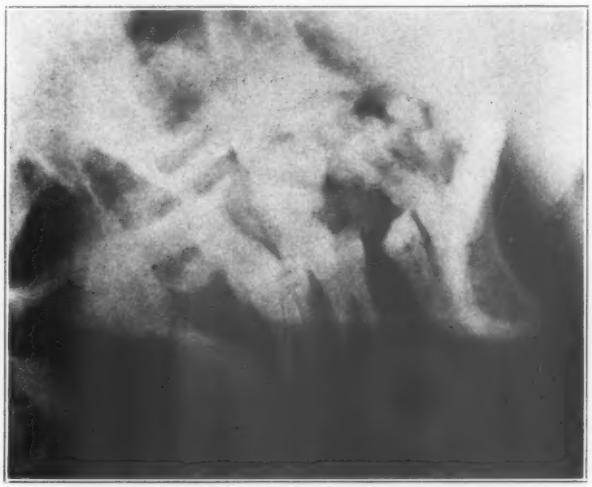

Fig. 3 (Case 3).—Fracture of left mandible, complicated by osteomyelitis, with sequestra present.

SPECIFIC INFECTIONS

Syphilis usually attacks the hard palate and bones of the nose, generally beginning with thickening of the periosteum after the secondary lesions have disappeared. The bone substance may be replaced or destroyed by gumma, the tertiary lesion. The breaking down of the gumma results in the loss of bone at the infected site, often leaving a perforation of the palate noted in late syphilis.

Tuberculosis of the mandible rarely occurs. This condition is more often found in the maxilla. The condition may be confused with an osteomyelitis, if physical findings and other symptoms are not considered. In this condition, there is a granulation tending to break down the bone *en masse*. The sequestra rarely separate completely. The break down of the bone results in a cheeselike slough, which must be removed by the curet, as it is not thrown off as in other sequestra. The tubercle bacillus does not form pus, though pus may develop secondarily.

Actinomycosis may be mentioned. However, it is not very common in man, and usually it does not involve bone. The disease begins with a small nodule, most commonly near the angle of the jaw. This nodule later softens and forms sinuses that discharge a thin fluid, and a diagnosis can be based on examination of this fluid, which may reveal actinomyces. The disease may be extremely painful. Osler suggested curetting away the granuloma; giving the iodide to the limit of the patient's tolerance, and repeated x-ray irradiation until the area of induration is absorbed.

TREATMENT

In acute osteomyelitis, the patient should be hospitalized as soon as possible. It is unfortunate that many patients are not hospitalized in the early stages. Some have had previous treatment, often mismanaged, or no treatment, which makes the case more prolonged, with difficult complications. Owing to the protracted treatment necessary, the patient will at times become restless and discouraged, believing he is not receiving all the care necessary to expedite cure. Therefore, the seriousness of the disease should be explained to him, the complications to be expected and the need for watchful waiting for exfoliation of dead bone, which often takes weeks or even months, the time depending on the resistance of the patient. Treatment consists principally in aiding Nature by the application of biochemistry and conservative surgery, with rest for the patient, and giving Nature time to restore destroyed tissue.

Sulfanilamide therapy should be started as soon as the case is diagnosed. The large initial dose is followed by smaller amounts to maintain the optimum blood level, with a decrease in amount until improvement is noted and the infection has subsided. Sulfanilamide powder may be implanted in an open wound, as in the case of compound fracture, with very satisfactory results. No systemic reaction has been noted from local use.

Thiamine chloride ($B_1$), if used, should be given in the early stages of osteomyelitis, starting with 100 mg. daily, followed the second week by approximately 50 mg. daily. The third week, cevitamic acid (vitamin C) should be given daily through the course of treatment.

Fig. 4 (Case 4).—Excessive destruction of mandible from right second molar to left cuspid, with destruction of buccal plate from right first molar to right cuspid.

Kings County Hospital, New York, has reported good results from the routine use of small doses of insulin in osteomyelitis, even though the patient was non-diabetic. This therapy was based

on the assumption that the resistance of the body to infection would thus be built up and the appetite, weight and strength be increased. Insulin is used in conjunction with calcium salts and viosterol, as follows: 5 units of insulin before the principal meal for at least two weeks; 10 grains of calcium lactate and 10 minims of viosterol three times daily. With this procedure, in more than 100 cases of compound fracture, osteomyelitis, which is common, was reduced approximately 40 per cent. In those patients with osteomyelitis already present, the case cleared up more rapidly, with fewer complications. Patients found to be diabetic should, of course, be under insulin therapy, and the blood sugar should not be over 200 mg. per hundred cubic centimeters for surgical operations.

In the early stage of osteomyelitis, must be regular. The patient's physical condition is a major factor in recovery.

In the surgical treatment of this disease, the important point to remember is conservation. Many vital, useful teeth have been extracted and sequestra removed before time, mutilation of the jaws and disfigurement resulting from mismanagement or radical operation. During the course of treatment, the operator must be on the alert for complications, which may consist of extension of infection to the adjacent soft tissues and lymph nodes or progress to pathologic fracture.

### SURGICAL TREATMENT

Treatment consists of:

1. Elimination or control of the cause.
2. Establishment of free drainage to infected areas.

Fig. 5 (Case 4).—Dental roentgenograms of right molars and lower anterior teeth, disclosing extent of bone involvement.

autogenous vaccines have been found very effective. Though good results have been obtained by the use of stock vaccines, in selected cases serums and antitoxins are used to destroy the microorganisms.

Absolute rest of the patient should be insisted on, and sedatives administered for relief of pain and to give adequate comfort. The patient should have enough water daily, from 3,500 to 5,000 cc., to maintain the normal fluid balance.

The diet should be light, rich in calories and minerals, with plenty of orange juice, milk and other foods high in vitamin D, to aid in bone repair. Elimination

3. Removal of sequestra.
4. Maintenance of the general condition of the patient.
5. Prevention of deformities.

As early as possible, establishment of free drainage of the focus, with the least possible trauma, is necessary, the operator bearing in mind that it is often inadvisable to operate until the white count is less than 12,000.

General anesthesia, the type being indicated by the patient's condition, should be employed. Procaine injections in the infected areas are contraindicated.

Some cases of osteomyelitis can be aborted if seen at the very onset by in-

cision of the soft tissue over the infected site and puncture of the cortical plate with sharp drills, to provide for the escape of foul serous and seropurulent fluid or pus. The tension will be relieved and the fever and pain will subside. Usually, the cases that come under our care have progressed beyond this stage, with suppuration already established, the pus being confined beneath the periosteum or having broken through into the soft tissue, a complicated and long standing case resulting. At this stage, we often find an extensive bone infection from previous radical surgical measures. It must be emphasized that no teeth should be removed. However, in the maxilla, occasionally a pulpless tooth can be removed without trauma, provided no swelling is present, in an effort to establish drainage of the infected site. Often, the teeth become so loosened by bone infection that exfoliation seems to impend. However, there are records of such cases wherein vital teeth have been ligated with wire for retention and have returned to normal usage after the bone infection has cleared up. Therefore, it is advisable to adopt a conservative attitude in extraction.

Establishment of drainage is indicated whenever it is believed that there is a collection of pus in the bone or beneath the periosteum. It usually takes from five to seven days for localization, which can usually be determined by the clinical picture. Incision without fluctuation is not indicated. However, fluctuation cannot be demonstrated in deep-seated bone infection, though the picture indicates that surgical interference is necessary.

The application of external heat, poultices, etc., to the face in a virulent infection is condemned. In their stead, icepacks are indicated, to reduce the inflammation and decrease the growth of bacteria. However, it is permissible to use external hot applications for localization of pus externally away from an important structure, in order that incision can be made without endangering the member.

### INCISION AND DRAINAGE

Incisions, when possible, should be intra-oral. It should be remembered, in incising the mandible, that the lingual nerve lies on the inner side of the mandible below the molars, separated from the periosteum by the mylohyoid muscle. If infection extends around the lower border, external incision is indicated. Incision is made in the submaxillary region, below the outer border of the jaw along the normal skin lines. In making this incision, it should be remembered that the facial artery crosses the body of the mandible about 2 cm. in front of the angle. Incisions are made with a knife through the skin and superficial fascia, the other structures being penetrated with a long curved hemostat. The incision should be adequate to admit the tip of a finger, but exploration should be made with an instrument. External incisions are made most commonly in the pharyngeal region, since the majority of infections of the jaw occur in this region. The incision is always extra-oral, being parallel with the inferior margin of the mandible, and a little distance below to avoid the lower branch of the facial nerve, and anterior to the upper part of the sternocleidomastoid muscle above the posterior belly of the digastric muscle.

Occasionally, from lack of early or adequate drainage of other areas, it will be necessary to make an incision in the carotid sheath. Owing to gravitation, this area can become a cesspool for pus. The incision is made along the anterior aspect of the lower part of the sternocleidomastoid muscle, usually above the posterior belly of the omohyoid muscle. In low-grade slow, progressive infections of the neck, this incision is seldom necessary. When the pus has traveled up the ramus, an incision above the parotid gland at the lower border of the zygoma may be necessary.

After an incision has been completed, perforated rubber drainage tubes are introduced into the depth of the space. The wound is left unsutured. If more than one incision is made, the incisions for drainage are connected by the rubber tube. Safety pins should be run through the exposed ends of the tube to prevent it from coming out. Some operators use iodoform gauze and wicks altogether for drainage. In some cases, this may be all right, but usually employment of these materials results in blockage, besides necessitating frequent changing of dressings, which should be avoided as the patient should not be disturbed any more than necessary.

During the acute stage, the use of irrigation, spraying or flushing the site of the infection should be avoided. Later, after the infection has reached a more chronic state, irrigation can be used with a mild antiseptic. The drug utilized is of little consequence as the cleansing is purely mechanical.

### THE SEQUESTRUM

As the acute stage subsides, the condition changes to a low grade infection, though repair is and has been under way since the onset. Dead bone is becoming detached in the form of a sequestrum. Roentgenograms at this time will reveal some bone changes. The sequestra will usually show in a picture at about eight to twelve weeks from the beginning of the infection. Removal of any bone attached to the periosteum should not be attempted. The sequestrum is not separated for about three months, and no attempt should be made to dislodge it, unless it is evident that it is free and can be removed with ease, and sufficient new bone has formed to maintain continuity of the structures. The involucrum is laid down on the periosteum to enclose the dead bone. If removal of the sequestrum is attempted before separation has taken place, the periosteum may be destroyed and thereby formation of new bone be prevented, with resulting serious deformity.

In this service, we find many cases of osteomyelitis resulting from compound fractures. It must be remembered that the involucrum is laid down on the periosteum in case of fractures as in osteomyelitis without fracture. Therefore, care should be taken to protect the involucrum in its important part in union. Furthermore, it has been found that the cases associated with fracture seem to progress better if the fractured parts are not immobilized for a long period. Slight movement of fractured parts does not hinder healing if no displacement occurs.

As mentioned previously, roentgenograms in the early acute stage are of no value in diagnosing disease of the bone. After a few weeks, some mottling of the bone may occur. In about six to eight weeks, one may be able to see a moth-eaten, hazy, uneven line between the dead and living bone, giving some idea as to the probable amount of sequestration. The case must be followed closely with roentgenograms to determine the time to remove the sequestra with as little damage to the granulation tissue lining their beds as possible. Sometimes, removal of the dead fragment is difficult. If the original opening for drainage has closed, it is necessary to reopen it, and, at times, the involucrum must be cut through to remove the sequestrum. At the time of removing the sequestra, overhanging dead bone should be smoothed. The disease may extend over many months, and several sequestrum may form, necessitating operating for removal at intervals.

Many operators report promising results in the treatment of acute osteomyelitis by the x-rays to abort the infection or lessen its intensity. Their use in the chronic stage will hasten resolution and promote healing. However, conservatism must be practiced with irradiation.

REPORT OF CASES

CASE 1.—*History.*—W. T. R., a white man, aged 47, farmer, was admitted to hospital February 26, 1940, for excessive swelling of the right jaw, which was very painful. A dentist had lanced an abscessed right molar January 19, and the condition following had progressed to the present stage.

*Examination.*—Several teeth were missing, carious and pyorrheic. The right mandible in the molar region showed a tender swollen area with some fluctuation. The patient was unable to open his mouth owing to muscular trismus. The temperature was 102° F. The urinalysis was negative. There was no syphilis. The pulse rate was from 80 to 120 day and night. The blood count was not secured. The coagulation time was four minutes.

*Diagnosis.*—The diagnosis was osteomyelitis of the right mandible. The patient was put to bed and given sedatives for relief of pain. February 27, the right submaxillary region was incised and a rubber drain tube inserted. February 28, the jaw was draining freely and swelling subsiding. The temperature was 99° and the patient was feeling much better. The dressings were changed daily.

*Operation.*—An 8 by 10 roentgenogram revealed an oval area of loss of bone of the right mandible, measuring 2 by 3 cm. (Fig. 1), extending from the cuspid to the third molar. As there was difficulty in opening the mouth, an intra-oral flap incision was made buccally to the bicuspids and molars, extending nearly to the lower border of the mandible. Approximately three-fourths inch of buccal plate was destroyed. The overhanging necrotic bone was removed and the cavity gently curetted. No sequestra were present. The cavity was packed with iodoform gauze. Drainage ceased and healing took place normally, with no recurrence. The remaining pyorrheic teeth were extracted July 26.

*Outcome.*—By December 1940, the healed ridges were normal and a full upper and lower denture was furnished.

CASE 2.—*History.*—C. V. F., a white man, aged 48, admitted to hospital on March 8, 1939, with a painful and swollen right jaw, stated that the trouble had started four weeks previous to admission after extraction of the right first and second bicuspids and first molar. The jaw had been swollen and painful at the time of extraction.

*Examination.*—Fourteen teeth were missing. There was pyorrhea, moderate to far advanced. The right jaw was swollen and fluctuation was noted from the lower right cuspid to the second molar. A roentgenogram (Fig. 2) revealed marked diffused destruction of the bone from the mental foramen distally to the second molar. No sequestra were revealed. The temperature ranged from 99 to 102° (chill during night). Urinalysis, Wassermann test and blood culture were negative.

*Diagnosis.*—Osteomyelitis of the right mandible involving the buccal plate was the diagnosis.

*Operations.*—The patient was put to bed and sedatives were given. Fifteen grains of sulfanilamide, daily for three days, was prescribed. March 13, under block anesthesia, a flap incision was made from the cuspid to the second molar. The buccal plate was soft and spongy. The necrotic bone was removed and the bone cavity gently curetted. Sulfanilamide powder was sprinkled in the open wound and the tissue flap loosely sutured to place, though not tightly enough to block drainage. The patient was seen daily. The swelling subsided and drainage was much reduced. March 18, it was necessary to remove more necrotic bone and a cuspid tooth which was pulpless. The cavity was packed at this time with a preparation of zinc oxide, powdered resin, oil of cloves and olive oil.

*Outcome.*—Healing of tissue was noted on the inside at the posterior aspect of the cavity. The inflammation in the region of the first bicuspid and cuspid was still "flaring up" every few days. March 24, a zinc oxide dressing was applied; some dead bone was removed, and a sulfanilamide powder used. Calcium was injected. March 29, no more necrotic bone was noted. A mild mouth wash was used. Healing took place normally with no more flareups. The patient was discharged May 1.

*Comment.*—It is believed that the general physical disability from pellagra and tertiary syphilis had much to do with the slow healing in this case.

*Readmissions.*—October 16, the patient was hospitalized for pellagra. Roentgeno-

grams revealed no recurring bone infection in the region of operation.

The patient was readmitted September 12, 1940, for treatment of pellagra. Auxiliary dental relief was rendered, consisting of extraction of the remaining lower teeth and some upper posterior teeth, because of far advanced pyorrhea. The patient was discharged October 28, without replacements.

He was again admitted February 19, 1941, for the same physical condition, severe pellagra. At this time, replacements were made for the teeth previously extracted. An 8 by 10 lateral view roentgenogram of the right mandible showed bone regenerating normally. The patient was discharged April 14, the dental treatment having been completed.

CASE 3.—*History.*—W. E. E., a man, colored, aged 44, admitted to hospital April 7, 1941, for pain and swelling of the left mandible, gave a history of being struck on the face by a heavy cup November 19, 1940, and having his jaw fractured. The jaw was in a plaster-of-Paris cast for about thirty days, and an abscess developed on the outside. The abscess was opened.

*Examination.*—Eight teeth were missing and there was moderate pyorrhea. The roentgenogram, Figure 3, reveals a complete compound fracture of the left mandible in the region of the second bicuspid. Several sequestra, with loss of much bone, were noted. The teeth were in fairly good alinement, with a slight downward displacement of the anterior segment. The temperature was 98°. The breath was fetid. The patient was somewhat undernourished. The Wassermann reaction was negative.

*Diagnosis.*—The diagnosis was: compound fracture of the left mandible, complicated by osteomyelitis.

*Treatment.*—The patient was put to bed and given a sedative. Sulfanilamide, 10 grains daily for five days, was prescribed.

*Operation.*—April 14, an extra-oral incision was made in the submaxillary region and between the fractured ends of bone. Two large sequestra were removed. Through-and-through drainage was established, a perforated drain tube being inserted. April 15, the patient was much better. The swelling was subsiding, and there was free drainage.

April 21, the fracture was reduced and held in place by an angle fracture band and rubber ligature.

A lateral view roentgenogram, taken April 22, shows that all sequestra the elimination of which was necessary at that time had been removed. The teeth were in alinement and occlusion. There was no evidence of new sequestra forming. The case was checked up daily. The fracture healed normally. The case was completed and the patient discharged June 20.

CASE 4.—*History.*—M. G. B., a white man, aged 48, was admitted to hospital April 2, 1941, with a provisional diagnosis of fracture of the mandible. He did not know that there was any trouble in the lower jaw until February 13, when he went to a dentist for repair work. An x-ray examination revealed what the dentist thought at first to be a fracture of the mandible near the symphysis. He then decided that it was a large cyst and sent the patient to the hospital. There was a history of having the lower right first molar extracted about fifteen years before. The tooth had been abscessed and was about two months in healing. The patient complained of pain in the back of the head radiating forward on the right side.

*Examination.*—Ten teeth were missing, one root remaining. One carious tooth, a lower right second molar, lay horizontally and was pyorrheic. Roentgenograms (Figs. 4 and 5) revealed marked bone destruction, creating a cavity involving the main portion of the mandible from the right second molar to the left cuspid. The lower border was intact, also the alveolar process about the teeth except the second molar, mentioned as pyorrheic. The root tips of the incisors and cuspids appeared to extend into the cavity. Further examination revealed that the buccal plate from the right first molar region to the right cuspid was injured to such an extent that fluctuation was noted in this area. The teeth reacted normally to a vitality test. The temperature was normal. The Wassermann reaction was negative. The patient was put to bed and sedatives were given.

*Diagnosis.*—The diagnosis was chronic osteomyelitis.

*Operation.*—April 15, a horizontal incision was made from the right first molar region to the left cuspid below the alveolar ridge. The tissues were retracted, then granulated

tissue that extended through the opening of the lost buccal plate was resected. The labial plate below the roots of the anterior teeth was removed from right cuspid to left cuspid. The cavity extended distally from the right first molar to past the third molar. However, the buccal plate of this region was retained. The entire cavity was found to be filled with a foul pus, which was washed out with a saline solution and packed with gauze saturated with hexylresorcinol combined with comphorated phenol, every day for three days, to obtain a slight analgesic effect.

*Treatment and Course.*—The cavity was sprinkled with sulfanilamide powder and packed with iodoform gauze and balsam of Peru. Dressings were changed every three days. The patient was given 50 mg. of vitamin C daily. Within a few days, an improvement in the general condition was noted, the headaches having disappeared and normal appetite returned. The patient was gaining in weight.

After seventy days of hospitalization, the patient wished to be discharged. In consideration of the high type of the patient, with particular reference to his personal care, it was decided, after thorough instruction on the home care of the mouth, that the patient's private dentist and physician should carry out the home treatment. The patient suggested that he return every thirty days at his own expense for a check up on the condition. He was discharged June 11 and returned each month, being seen last in February 1942. It was noted at the last visit that the cavity was filling in nicely with healthy tissue, and only a very small pack was necessary in the right first molar region. The patient was advised that healing would require many months and that possibly there would always be a loss of bone evident in the mandible. No noticeable disfigurement will result, as the teeth have been retained (except a root, the left lower first bicuspid and the right lower second molar) to prevent collapse of the structures and possible pathologic fracture.

It is impossible to present all phases of osteomyelitis of the jaws in one paper, but it is believed that this paper gives a fair picture of the disease as to location, etiology, symptoms and course of treatment. The essential elements in successful treatment are: 1. Restoration and maintenance of the general condition of the patient. 2. Conservatism. 3. The establishment of free and adequate drainage, with minimum trauma. 4. Removal of sequestra at the proper time. 5. Prevention of facial deformities. 6. Instructions to the patient regarding oral hygiene and diet for home care after discharge from the hospital.

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# DISCOVERERS (?) OF ANESTHESIA: THE CLAIMANTS

By Max E. Soifer,* D.D.S., Hartford, Conn.

IN a park in Hartford, Conn., near the state capitol, there stands a bronze statue of a pleasant faced young man. This statue was erected in 1875 from funds donated by the State of Connecticut, the City of Hartford and countless dentists throughout America. Upon its granite base are inscribed the words:

HORACE WELLS
THE DISCOVERER OF
ANESTHESIA
DECEMBER 1844

In the small village of Jefferson, Ga., in the drowsy public square, there is an obelisk of granite which bears the legend:

IN MEMORY OF
DOCTOR CRAWFORD W. LONG
THE FIRST
DISCOVERER OF ANESTHESIA

In Boston, Mass., in old Mount Auburn Cemetery, there is a graceful fluted column bearing these chiseled words:

WILLIAM T. G. MORTON
INVENTOR AND REVEALER OF ANESTHETIC INHALATION,
BY WHOM PAIN IN SURGERY WAS AVERTED AND ANNULLED

The question is asked, which of these three claimants was the true discoverer of anesthesia? It is the purpose of this article to present some pertinent facts, to allow the reader to make his own deductions.

Let us first examine the qualifications of a discoverer. Walter R. Steiner, past president of the American Association of the History of Medicine, in 1937, said[1]:

> To make a discovery one must find out or invent something, then demonstrate it and proclaim it to the world; finally one must convince the world of the validity of his discovery.

With these conditions as a yardstick, let us consider the virtues of the claims regarding Long, Morton and Wells.

## LONG

Crawford W. Long, graduate of the University of Pennsylvania School of Medicine, and a practicing physician and druggist, lived in Jefferson, Ga. About the time when he first used ether, it was not uncommon to utilize this agent at select parties for entertainment purposes. In fact, this use of the exhilarating property of ether first turned Long's thoughts to its employment for the removal of a small tumor from the neck of James Venable. (March 30, 1842.) For the utilization of the anesthetizing ether on this and a few other occasions, the claim is made that Long discovered anesthesia. If, however, we carefully examine Dr. Long's own records, we find innumerable instances of a charge of 25 cents for the administration of ether when no operation was performed. I believe that this fact is most significant. Observers are inclined to interpret this action to mean that Long continued to use ether for revenue and entertainment purposes only. Certainly, if Long himself had realized the potentialities of ether for the relief of pain, he would have published this fact immediately in one of the many medical periodicals available at that time. He would have used every means known to inform the world that there was within his grasp this God-given blessing.

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We may also ask why Long waited until 1849, seven years later, to present his claim to the Georgia Medical Society. Long himself probably felt that he had found nothing new. Certainly, he had no principle on which to base a claim. Nor is it sufficient to say that the use of ether was looked upon with disfavor by the residents of Jefferson and hence Long hesitated to recommend its use locally for fear of losing his patients and his livelihood.[2] Pioneers and discoverers generally do not shrink from criticism. If need be, they give their lives for the privilege of presenting their discoveries to the world. The names of those who were willing to give their all in great inventions that the world sorely needed is legion. If the idea that he had discovered a much needed means of relief for humanity had entered Long's mind, he would not have rested until the world knew of his work and acclaimed his findings.

Why, then, did he wait seven years before recording his activities in a medical journal? Congress at that time was considering the claims of Morton, Wells and Jackson, with a reward of $100,000 offered to the discoverer. It was only after Charles Jackson had visited Long and realized that the latter had a basis for entering his name for the congressional reward that he urged Long to allow his claims to be presented along with the others.

It was in this year also that the Georgia Medical Society endorsed the Long claims and referred them to the American Medical Association for approval. It is recorded that the association did not find the facts sufficiently clear to approve this petition. Twenty-one years ater, in 1870, after the American Medical Association had had ample time to study the claims of all aspirants, it awarded the title of "Discoverer" to Horace Wells, a dentist. It was Long himself who, when addressing the medical society of his own state in 1852, plainly admitted[3]: "I know that I deferred the publication too long to receive any honor from the priority of the discovery."

Here, then, we have Long's own admission, ten years after his use of ether, eight years after Wells' experiments with nitrous oxide, six years after Morton's successful applications of ether to surgery, and four years after Simpson's use of chloroform to produce anesthesia in obstetrical practice, that he had told his story just a bit too late. It is worth noting that, despite sporadic efforts to raise the issue again and again, no new facts have as yet been presented to alter the judgment of the professions that Long was not the discoverer.

The honors to Long have been exceedingly few and confined mainly to his own state. An obelisk here, a tablet there, an occasional celebration, such as was held recently in Georgia to mark the Long centennial, may raise the spirits of its loyal citizens, but does little beyond this. His classmates at the University of Pennsylvania have honored his memory with a suitable tablet. Congress accepted a Long statue as a gift from the State of Georgia for Statuary Hall and the pseudohistorian Ex-Postmaster James A. Farley authorized a postage stamp, despite tremendous protests from the professions, bearing his name. We honor Long for his endeavors, but frankly concede that had he died soon after his experiments, the world would hardly have known that the use of anesthesia was even of interest to him.

### WELLS

The part that Horace Wells played in the discovery of anesthesia has been related many times. He was born in Vermont in 1815, and was educated in the New England schools. He finished his study of dentistry in Boston in 1836, under private practitioners. He then moved to Hartford, Conn., where he started to practice his profession. Almost from the start, he attained phenomenal success. Within two years, he had become well known and had published a treatise en-

titled: "An Essay on Teeth, Comprising a Brief Description of Their Formation, Disease and Proper Treatment."[4] He began very early to seek some means of relief of pain during dental operations. Many testimonials attest to the fact that his search for some such medium was the subject of constant conversation with friends and patients.[5] A physician who was his patient says that Wells often mentioned the subject during office visits. Charles Noel Flagg, the famous New England artist, recorded that his father, the Rev. Jared Flagg, was a next-door neighbor of Wells and that the subject was often discussed by the two men.[6, 7]

December 10, 1844, Wells witnessed a public demonstration of the use of nitrous oxide for entertainment purposes. Noticing that one of the several young men who were volunteers for this experiment had hurt his ankle severely, but did not complain of pain until the effect of the anesthetic had worn off, Wells made inquiry of the demonstrator, Gardiner Q. Colton, as to whether this agent had ever been used for the painless extraction of teeth. When advised that it had not been so employed, he set about at once to use nitrous oxide to confirm his belief that human tissues could be rendered insensible to pain. Desiring to prove this at once, he hurriedly conferred with his associate, John M. Riggs, and arranged for Dr. Colton to bring a bag of "laughing gas" to his own office the next morning for the trial. Knowing little of the action of this gas, but willing, if need be, to risk his life to prove his theory, Wells, in the presence of several witnesses, permitted Colton to administer the gas to him while Riggs removed one of Wells' molars.

This experiment was a success, and thus on December 11, 1844, the use of nitrous oxide to relieve the pain of dental operations was made known. Wells immediately started to administer the gas in his own practice for surgical operations.[8] The fact was proclaimed at once. After several weeks of trial, Wells went to Boston to offer his discovery to a large medical group in that city.

From the time of its first trial, in December 1844, until his death in 1848, Wells continued to employ nitrous oxide for dental and surgical operations, with the exception of brief periods when he was forced to discontinue practice temporarily because of a chronic lung ailment. The news of his success could hardly be considered a secret, since it was the subject of discussion in lay and professional periodicals.

A Hartford physician, E. E. Marcy, writing in the *Boston Medical and Surgical Journal,* June 1845, gave wide publicity to the fact that nitrous oxide was being used in Hartford with success for the relief of dental and surgical pain. Recognition of Wells' work came early, in resolutions of the Connecticut Medical Society, the New York State Medical Society, the American Medical Association, the American Dental Association, the International Dental Federation and many other professional groups. A few of the memorials to Wells are the abovementioned statue in Bushnell Park; a memorial plaque on the site of his office; busts in the Army Medical Museum and the Northwestern University Dental School; a silver plaque from the Spanish Odontological Society; a statue in Paris from the International Dental Federation and an inscription of his name as "one of the Immortals of Dentistry" on the Mace of the American College of Dentists.

Space does not permit a recital of the many tributes paid to Wells in dental and medical literature during the past century. One notes with satisfaction that such present leaders of the profession as Arthur H. Merritt, Past President of the American Dental Association and the American College of Dentists[9, 10]; J. Ben Robinson, President Elect of the American Dental Association and of the American Association of Dental Schools; L. Pierce Anthony, Editor of the JOURNAL OF THE AMERICAN DENTAL ASSOCIA-

TION,[11] and Mendel Nevin, distinguished author and publisher,[12] as well as a host of other professional leaders, take every opportunity to praise the accomplishments of Wells. On the occasion of the ninety-fifth anniversary of the discovery of nitrous oxide (1939), three major radio networks devoted time on their national hookups to portraying the events of December 1844 as a tribute to Wells. The American Dental Association, at its 1941 convention in Houston, officially endorsed plans for a Wells Centennial Celebration for 1944 and appointed a committee of its members to arrange for a fitting commemorative program.

Wells, it appears, discovered something which he demonstrated and proclaimed to the satisfaction of the laity and the professions, which have unqualifiedly endorsed his claims. That he preceded Long and Morton in publishing his claim, is simply a matter of chronologic precedence—Long made public his discovery in 1849 and Morton applied ether in 1846.

### MORTON

The career of William T. G. Morton was checkered and filled with exciting episodes. He was praised and blamed with equal zeal. He entered the professional panorama by marrying a girl from Farmington, Conn., not far from Wells' home. He studied dentistry with Wells, as did Dr. Riggs, during the years of 1841 and 1842. It was while under Wells' tutelage that he learned to regard and respect his teacher's ability. When he felt that his preparation was complete, he planned to return to Boston to open an office. Lacking funds and knowing that Wells had conceived the idea of soldering teeth for dental restorations, he asked Wells to become his partner in Boston for a joint venture. Wells was to retain his own practice in Hartford and make visits to the Boston office to assist Morton until he was sufficiently experienced to conduct the practice alone. Horace Wells' daybook for the period, now in the Walter R. Steiner Medical Library, Hartford, contains the record of expenses which Wells had listed to inaugurate the venture. It likewise contains a charge to William T. G. Morton for "operations on teeth and instructions in the art of dentistry, $50." The partnership began in November 1843, to continue for a period of one year. However, Wells found it necessary to end his active association with his former student much earlier. Certain friends of Morton have attempted to point out that it was Wells' habit to enter on a venture and then abandon it. The real reason, however, for this short-lived partnership is evident in a letter which he wrote early in July 1844 to his mother and sister:

> You undoubtedly feel anxious to know how I came on with my Boston business. I will tell you—in short I was not in partnership with Morton but 4 weeks. I found him to be a fellow without any principle whatever. You recollect when I visited Boston—well, the object of my visit then was to see if I could not influence him to pursue a different course from what reports told of him. After I had been with him one week in Boston I was satisfied that he possessed no self-denial, and I very much feared he would become a drunkard and my last words to him when I left were to be cautious and not taste of anything that might excite him. Consequently, I was not at all surprised when report came that he was in the daily habit of visiting grog shops. Aside from that he was the most deceitful man I ever knew. He would not scruple to tell direct falsehoods when he knew that he must be detected in a lie within a few hours. He is now married. I attended his wedding in Farmington a few weeks ago—and if I ever pitied anybody—I truly pitied that girl. She however has heard these reports about him, but it made no difference. Love they say is blind—and I am sure that it was in this case. He has married a fine girl and I fear she has found her mistake ere this—

By the way, I am on perfectly good terms with Morton and would not on any account be otherwise. He refunded to me the money which I had expended in starting the office and I was exceedingly sorry that I had not selected a man to conduct the business there in whom I could place confidence as our prospect for business there was beyond our most sanguine expectations, in fact it would be easy enough to realize a fortune there. . ." etc.

This letter was written several months before Wells' discovery, and his private opinion of Morton was not made public by Wells during his lifetime. It has recently been brought to light in letters in the possession of Wells' surviving relatives.[13]

Morton continued his practice in Boston after Wells' departure. They met again in January 1845, when Wells came to Boston to present his discovery to medical circles there. Wells visited Morton and his associate, Dr. Jackson, and told them of his discovery and his plan to present his finding there. Morton was present in the audience when Wells gave a demonstration, removing the tooth of a young boy under the influence of nitrous oxide. Wells, working alone during the administration of the gas and the extraction of the tooth, probably was so excited that he failed to keep the patient sufficiently under the gas to attain its maximum effect. The patient screamed —a not unusual reaction of patients under anesthesia—but later testified that he felt no pain during the operation. When we recall Morton's habit of exaggeration, we are not surprised that he later wrote in his memoirs that Wells was hissed from the platform. This statement is not confirmed from any other source.

Wells returned to Hartford and heard nothing from Morton until later that summer, when Morton came to Hartford to pay Wells a part of some money he had lent Morton. Unfortunately, Wells was temporarily not practicing, owing to illness. Morton then sought to give credence to the story that Wells had discontinued his practice of dentistry and had abandoned nitrous oxide as an anesthetic. Early in the spring of the following year, 1846, Morton met a young woman who had recently had a tooth extracted by Wells under gas anesthesia. This report prompted Morton to visit Wells to question him concerning the use of gas anesthesia. On this occasion also, Wells was temporarily indisposed, but he willingly took Morton to the office of his associate, Dr. Riggs, where both Riggs and Wells explained in detail how nitrous oxide was employed for dental operations. Morton inquired as to how the gas was prepared and was advised to return to Boston, where his associate, Dr. Jackson, who was both a physician and a chemist, could give him specific instructions as to its manufacture. This advice Morton heeded, but, during later conversations with Jackson, he was advised to try ether instead. Morton procured a bottle of ether and tried it on the first available patient, with such success that he set out to experiment with it farther for operative purposes.

The success of this and other endeavors on Morton's part led to the arrangement of an inhaler by which the anesthetic could be more easily administered. Perfume was added to the ether to disguise the odor. This concoction, under the name of "letheon," a Morton-Jackson invention, was exploited commercially. A patent was secured and the right to use ether in this form was sold through franchise at exorbitant prices. As was only natural, a quarrel arose among the three friends, Morton, Jackson and Wells, when Morton sought to have himself named as the "discoverer of anesthesia."

Time and space do not permit a long recital of the means used by Jackson to deprive Morton of the honors that were accorded him in Paris, which resulted eventually in the award of a prize to Morton by the French Academy; nor of how Wells himself made a trip to France

about the same time to present the facts of his discovery. Morton at first sought secretly to secure the entire patent under his own name, but Jackson, not to be outdone, demanded his portion of the patent profits. He assigned his share of the patent to Morton to avoid censure from his medical society, since no physician of standing was allowed to gain from any procedure for the welfare of humankind, and, in return, he received from Morton a guarantee of a portion of any monetary gains. The periodicals of the day bristled with claims and counterclaims.

Nor was this all: The nefarious methods used by Morton and his agents to employ this patient against the interests of medical and dental practitioners aroused indignation in professional circles. Many professional groups, through resolutions, censured Morton for his actions. It is difficult to estimate the vast sums of money procured through unfair means in the promotion of the patent. Honest men who had inaugurated the use of ether, on the basis of Wells' established principle, found themselves threatened by Morton's agents. Many were told that unless they paid the tremendous fees required for the use of "letheon," they would be forced out of practice. Incredible, you say. Then read portions of letters addressed to Horace Wells (which I proudly regard as my cherished possessions) now faded by the passing century.

Charles Merritt, of Bridgeport, Conn., wrote January 8, 1847:

> . . . It is not from motives of curiosity that I am induced to trouble you but for the following reasons—Dr. Morton has sold the Patent for Fairfield County, and the individual to whom he has sold it (a practicing dentist residing in the County) refuses to resell the right of using it in this city alone for less than a very exorbitant price, thereby attempting a second speculation upon Morton's first. They threaten to lay an injunction upon any person using vapor of any description for the purpose of alleviating pain, but if it is true that you are the originator of the Vapor, then his Patent is worthless and any person may use it. . .

J. F. B. Flagg, distinguished author of a text on chloroform and ether, concluded a letter of March 11, 1847, to Wells with the following words:

> . . . I will merely add that I have no fellowship with those who will aid in any manner, the consummate quack in levying blackmail or any other tax upon the legitimate healing art. . .

A. W. Kingsley, of Elizabethtown, N. J., wrote to Wells April 8, 1847, as follows:

> . . . I have administered ether a few times in dental practice (merely with the view of satisfying myself of its power and utility). This I saw fit to do without purchasing the *patent right* because I know Dr. Morton's claim to the discovery was disputed. I am now threatened by Dr. Morton's agent with immediate prosecution unless I will purchase of the patentee of this county one half of the county right. . . . I think I shall allow them to prosecute rather than yield to their exorbitant demands. . . .

Other letters from distant cities in New York, Ohio, Alabama and Vermont were received by Wells with the same story of threatened suits and injunctions. Many of them implored Wells to come to the aid of the writers in defending their rights in court.

We should remember that these communications followed only a few months after October 1846, when Dr. Morton gave his first public demonstration of ether for surgical purposes at the Massachusetts General Hospital. This successful performance immediately brought attention to the additional possibilities of this agent for the relief of pain based on Well's principle of anesthetization. This one beneficent act was sure to gain respect and acclaim for Morton, but his zeal for monetary gain marred the seemingly bright horizon.

Congress was shortly confronted with further claims by Morton for compensa-

tion based on the use of ether by the Medical Corps of the Army and Navy. The select committee to whom this bill was referred found that it had not only the claims of Morton, but also those of Wells, Jackson and eventually Long to consider. The bitter fight continued through several sessions of Congress, without any decision on the subject. One can read the apparently honest claims and evidence submitted for all claimants and appreciate the confusion that must have filled the minds of those trying to decide the question. The controversy was never settled. It did, however, come to the courts some years later, when Morton sued the New York Eye Infirmary for the "unauthorized use of ether in surgery" without patent payments.

The trial judge before whom this case was tried declared that the original patent granted to Morton was null and void because the claims upon which this patent was granted were without foundation. (Morton and Jackson, in applying for the patent, had stated that the manner in which they applied the anesthetic was for the first time made known to science.) Judge Simpson, in his verdict, stated that "it was only the extended use of a previously well-known principle," hence no basic patent could be granted.[14] This decision not only nullified Morton's oft-repeated claim as discoverer, but virtually confirmed the fact that Wells was entitled to his claim to first enunciating an important principle for the benefit of humankind. The judge did praise the work of Morton as beneficent and commendable. This acclaim the world has given in many forms. A statue to his memory in Boston Commons and an inscription on the Boston Public Library attest the esteem of his fellow townsmen. A bust of Morton is in the Hall of Fame, New York University. The American Dental Association unveiled a tablet to Morton, along with one to Wells, at the 1933 Century of Progress World's Fair in Chicago. By plaque, resolution and inscription in stone and metal, humanity has paid tribute to his name for his part in advancing the use of ether in surgery.

Certain facts on review would appear to be clear. Crawford W. Long used ether in 1844. Horace Wells announced and demonstrated the principle of anesthesia in 1844 by the use of nitrous oxide. William T. G. Morton, in 1846, advanced anesthesia through the use of ether for surgical operations in a public demonstration. These, and many others since that time, we honor for giving the world relief from pain in surgery.

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# DENTISTRY'S PLACE IN A HEALTH SERVICE PROGRAM

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IT is customary to divide those who discuss dentistry into two camps, those who believe that the dental profession should be absorbed by the medical profession, and those who feel that dentistry should endeavor to make its contribution to the public independently of other educational and professional groups. I shall discuss a proposal which advocates neither of these, but puts dentistry in its proper place in a scheme of total health service. This necessitates some suggestions in regard to medical education and education for health service in general.

Dental education is now in a phase characterized by university interest and control, by expansion and intensification of research and by a growing interest in public health. It is important that every advantage be taken of this situation to further dentistry as a health service. Dental education originated as an apprenticeship, passed through a period marked by the stranglehold of proprietary interests and is now emerging as the profession it should be, scientifically, and in terms of public service. A necessary step in this development is the closer coordination of dental and medical education; medical education in its broadest sense.

Early dentistry[1] had a separate existence. Recent investigations indicate that it was not cast off by medicine, as has been commonly believed. The founders of dental education felt that a scientific basis was as important for dentistry as for medicine and hoped eventually to elevate it to the position of a specialty of medicine. At that time, there was little about dentistry to cause medicine to regard it as important from the health point of view. Dentistry had not made significant additions to the basic knowledge in this field, as had anatomy and physiology. Also medicine was in a bad way at this time, being in the throes of commercialism and in no position to assume responsibility for dentistry. As an independent profession, dentistry made rapid strides, particularly in the mechanical phases of its service. There had been a number of observations and reports on the systemic relations of dental disease before 1840, but no scientific proof; hence, dentistry was restricted to repair and replacement procedures.

The founders of the first dental school apparently recognized the need for institutional dental education, but there were no legal restrictions, and preceptorial training continued to be a strong competitor for students. A single quack could turn out as many practitioners as the college. Slowly the number of the schools increased. By 1870, there were ten, and one, Harvard, had a university affiliation. Nine other universities followed Harvard's example in the next sixteen years. In 1879, it became necessary in some states to be a graduate of a dental school in order to practice. This did away with the preceptor, but served to usher in the commercial era in dental education. From 1870 to 1900, the number of dental schools increased from ten to fifty-seven. Dominated by proprietary schools, dentistry had little opportunity during this period to add to its basic knowledge, and the twentieth century arrived before dentistry was able to shake itself loose from commercialism and make any appreciable advance in the

way of a university affiliation. The Carnegie Survey of dental education[2] was a powerful factor in clearing out the proprietary schools. However, in many instances, when proprietary schools were taken over by universities, it was a case of the university being "taken in." Many universities assumed control of privately owned schools on the assumption that the clinic fees and tuition would pay the operating costs and yield a profit to the university, perhaps, but where these schools have been raised to the university level, it has cost the university many times the amount of the school's income.

Affiliation with a university was not in itself a guarantee of improvement in educational standards. An unproductive faculty is no better for being attached to a university and would do as much for its students and for society if it were functioning in an independent vocational school. For some time, also, the teaching of basic biologic sciences, even under university supervision, was mere "window dressing" and was not regarded as essential by dental teachers or students. As a result, the teachers of basic sciences, who usually were physicians and who felt that the university had made a mistake in admitting the dental group, were scornful of both the dental student and the dental curriculum. Dental students were regarded as unwelcome guests in anatomy, physiology and bacteriology classes, and their instruction was relegated to the teachers who were not considered quite good enough to teach the medical students.

The following quotation from a medical school educator illustrates the general attitude of physicians toward dentists and dentistry:

> Dentistry claims to be a profession and would have this claim allowed by others, although dentists talk to each other about their *business*. Dentistry is in large part a fine handicraft and does work of a technical beauty comparable to the jeweler's art, but it has too often failed to consider whether its results will ultimately benefit or harm the individual thus decorated.[3]

As recently as 1938, the report of the Rockefeller Foundation expressed the following opinion of dentistry:

> Although America leads the world in dentistry, it is a leadership based more upon ingenuity of a mechanical sort than upon the amount or character of research done on the anatomy, pathology, or physiology of the oral cavity. Almost no dentists are trained in such a way that they can do research of a quality comparable to the research in medical schools on medical and surgical problems. Until our dental schools are brought more closely into line with our medical schools, much of the brilliance of American dentists will remain that and nothing more, and the essential curative and preventive measures will go unstudied.[4]

The normal and immediate reaction to this scathing criticism of dentistry is resentment. We know that many of the statements are no longer true, if they ever were. On the other hand, we know also that all of the shortcomings of dental education which were enumerated in the Carnegie Report of 1926 have not been removed, but it seems a bit unfair to ignore the tremendous progress that has been made by schools which have been given half a chance, or to overlook the very extensive and valuable research that is being carried on in those institutions where even scanty financial assistance has been secured. It seems unfair to compare the best in medicine with the worst in dentistry, and the comparison is in particularly bad taste when it comes from members of a profession only recently forced out of a period of charlatanism and commercialism far surpassing anything in the darkest days of dentistry. A large part, perhaps the greater part, of so-called medical research has been and is being conducted in the basic sciences by research workers who are not members of the medical profession. We are all familiar with the monumental contributions of Pasteur,[5] and we know how

he had to fight to get his truths across to a smug and complacent profession, and how today his work is regarded as one of the greatest contributions to medicine. There are numberless similar cases in the past, but it would be grossly unfair to ignore the many brilliant contributions by physicians.

Whether or not the criticism of dentistry has been fair, we can neither ignore it nor assume a persecution complex if we are to continue to develop dentistry as a scientific profession. We may object to having others criticize us, but we must be willing to criticize ourselves. We all know how miserably we have failed to cope with the problem of dental disease. Only a small part of the population receives dental care. The incidence of dental caries, according to qualified students of the problem, continues to increase despite general improvement of the diet of school children. Dentistry as a health problem will remain insoluble if our excellent technical dentistry is to be the sole preventive agency. The solution lies not in the increase of facilities for training more technical dentists, but rather in increasing the body of biologic knowledge pertaining to diseases of the teeth and gums; in a closer coordination between dentistry and other branches of health service, and in orienting dental education in a much needed reorganization of health service training.

Just how should this be brought about? It is evident that there can be no real coordination of dentistry and medicine until the barnacles of traditional prejudice are removed from both professions. Not only must dentistry continue to improve, but also medicine must display a willingness to cooperate, which has not been too evident in the past.

Harvard University[6] recognized the futility of continuing to turn out more and more dentists of the traditional type and has swung to the other extreme by entering upon a program which apparently will produce neither physicians nor dentists competent to treat human ills. The contention is that Harvard is experimenting with a method that will produce teachers and research workers for dental schools. Dentistry should welcome experimentation in education. Times are changing and these changes are making new and greater demands on the dental profession. Dentistry is alive and eager to consider new proposals. The new plan at Harvard will give medical students some conception of the teeth as a part of the human body and that will be an innovation and is highly desirable. The fact that Harvard was able to secure $3,000,000 to finance a dental program for all time to come is an achievement of monumental proportions. How this plan, with its nine students, with an ultimate limit of fifteen, is to turn out teachers and research workers for the dental schools is not quite clear. If the graduates are to teach the basic sciences, certainly they need a better background than is provided in the undergraduate medical curriculum. If they are to teach technical or clinical subjects, their preparation in that field should not be inferior to that now provided dental students. When not teaching, these superdentists will be conducting research for which the courses of the medical curriculum supposedly have prepared them. Other medical schools are immensely pleased if they turn out a man every few years who eventually develops into a research worker, and they are not inclined to believe that the undergraduate medical course is the best training for either teaching or research. However, this much heralded dental-medical program intends to create teachers and research workers out of all students accepted.[7]

For years, Columbia has offered a combined course whereby graduates of recognized medical schools can take the dental degree in one summer session and two additional years. Last year, we graduated three such students, all of whom had the full training required to

practice medicine plus the full dental curriculum. Columbia found it possible to put this plan into operation some years ago without soliciting a large sum of money for the purpose, and without shutting off the supply of dentists to care for the present dental needs of society. These graduates of Columbia with the doctor of medicine and doctor of dental surgery degrees are not, by virtue of their training, prepared for teaching or research, but have made a good start in preparation for a specific type of practice.

We think we have a better way of training teachers and research workers. After selecting our students with care and having them under close observation for four years, we are able to select one or two a year who, we feel, have some interest in and some aptitude for teaching and original investigation. On graduation, these men are given minor teaching positions on one of the staffs. A year or two here confirms or disproves our original opinion. If the young doctor displays increasing ability, we encourage him to seek a fellowship in another institution, where he takes work toward a graduate degree in one of the basic science fields, and makes contacts with new people and new ideas. If some other dental school does not take him, he returns to us and is given additional responsibilities, usually with a combined clinical and basic science appointment which will enable him to correlate the basic sciences with his clinical teaching.

On the other hand, if our opinion of him as a student is not borne out by his performance as a minor teacher, the young man is encouraged to devote himself to practice. At present, we have twenty different colleges and universities represented on our faculty; but if the time comes when we are in danger of becoming inbred, we can correct the situation by taking graduate students from other schools where they have had sound undergraduate training. This type of well-trained teacher does more than anyone else to break down the barriers between the medical school and the dental school faculties. There is little lack of cooperation when the two professions speak the same language.[8]

Much of dentistry's difficulty in effecting a more satisfactory working relationship has been due to the difference in our student bodies. At Columbia, it is our confirmed belief that the most important single factor in improvement of dental education and dental practice and dental research is the careful selection of the student body. Deans and faculties will pass away and be replaced by the students of today, and the teaching and the practice of the future will be no better than the men who are today entering dental schools. Unfortunately, most dental schools do not have a sufficient number of applicants to permit much in the way of selection.

Dentistry is placed in a very embarrassing position by being obliged to compete with medicine for students. Dentistry has not been made so attractive to young people as medicine. Dentistry has had but little publicity, and the glamour and romance attributed to medicine have drawn thoughtful youth to the broader, more inclusive field in numbers far greater than can be accommodated. The applicant to a medical school is not required to decide until late in his training whether he wishes to practice obstetrics or internal medicine, but the dental student must make his choice before he has had an opportunity to discover his own interests and abilities. As a result, a young man announcing that he is going into dentistry feels as though he should apologize for his choice.[9] His announcement is frequently met with the query, "Why are you not going into medicine?" If dentistry is an important branch of health service, it is tremendously important to all of us that it be made attractive to the best of our youth. To bring this about, we need intelligent publicity, we

need wise counseling of youth and we need contributions earmarked for dentistry so that the universities may be able to offer to students of dentistry teaching facilities and living facilities which are in every respect equal to those offered to students in medicine. Inability to attract desirable students in sufficient numbers and the lack of funds adequate for their training and for research were major factors in the decision to discontinue the Harvard Dental School.[6]

The need for well-trained dentists is evident and the opportunities are great for those who can qualify. Intellectual ability, skill, character, personality, proper behavior and a sense of propriety are required. At Columbia, the scholastic requirements are the same as for medicine. The basic science courses are taught to medical and dental students in the same class or by the same staffs and are qualitatively equivalent. The opportunity for service to others, a scientific career, research and artistic achievement is present to an exceptional degree, yet many dentists encourage their sons to go into medicine.

For ten years, we gave a series of aptitude tests to all applicants, tests designed to bring out finger dexterity, sense of proportion and perspective, accuracy and and neatness. In spite of the fact that these tests helped to identify students who were decidedly lacking in these qualities, we now limit the test to those students who request them and to those who have college records below a grade of B. The reason for attaching less importance to these tests is that, we feel, it overemphasizes the mechanical aspects of dentistry and tends to cause the student to study the basic sciences of the first two years with poorly defined aims and later, during the clinical years, to engage in a study of the art of dentistry as though it had no relation to the sciences.

Dentistry has made tremendous progress as a result of new knowledge, knowledge which is bringing about changes in teaching and in practice. As new knowledge is forthcoming, as a result of greater emphasis on the biologic sciences, further changes in practice will be indicated. However, there is no reason to believe, nor historical evidence to support, the idea that dental needs, immediate or remote, will be better served by the absorption or domination of dentistry by medicine. The process must be one of cooperation. While endeavoring to solve the problems of dental disease for the benefit of future generations, dentistry cannot shirk its responsibility to care for the reparative and restorative needs of the present. We need not less mechanical ingenuity, but more research. We can work toward securing students who are capable of self-education and who will continue to grow after graduation. We can develop teachers who are competent to utilize the basic science phases of their subjects and who are familiar with the content of related courses and can speak the language of the physician and the basic science teacher. True, we need to bring dentistry and medicine closer together, but this cannot be done by abolishing dentistry.

It seems to me that this can best be brought about by so organizing our entire educational program as to provide a common educational background for all those desiring to enter the health service field, by reducing the number of years of preprofessional preparation and by breaking up the professional training into units capable of assimilation and practice in the lifetime of a normal individual. Dentistry could be included in such a health service program without losing its autonomy or the gains of the past one hundred years. The problems which dentistry is now facing with little hope of satisfactory solution would be automatically solved, and dentistry could continue to progress through cooperation with other health branches rather than in competition with them.

As previously stated, at the time of the founding of the first dental school, medicine was in no position to take on the responsibility of dentistry even if dentistry's background of knowledge had justified such an amalgamation. Today, dentistry has added greatly to its total of scientific knowledge, and medical education is pretty well out of the proprietary school stage. However, medicine is still in no position to absorb dentistry. At one time, medicine could be mastered in a few months, and the physician saw his patient, prescribed his pills and compounded them himself and had time enough to spare to take out a tooth or two. The total of knowledge in the medical field, using the term in its restricted sense, has grown to such an extent that it is no longer possible for an individual to encompass the entire field. The medical schools admit that they can give the student only the fundamentals, and the new knowledge continues to accumulate at an ever-increasing rate. Adding dentistry would make the problem still more complicated.

The dentist has been accused of conducting his practice as a business, but it might be well if America were to apply some of the efficiency devices of big business to the task of providing a complete health service to all the people. In business, we customarily think of size and mass production as going hand in hand with increased efficiency and lower production costs, but I recall that, in a course in economics taken in my college days, the telephone exchange was cited as one example of a business which could grow only so far and then the cost of rendering additional service would far exceed the amount received for that service. The solution, as we all know, is to set up additional exchanges when this optimum point has been reached. Medicine is in much the same situation as a telephone exchange which has been expanding and expanding, to the detriment of itself and its service, without having the courage to set up some additional exchanges. If this overgrown public health service were divided into efficient units, obstetrics would be one, internal medicine another, dentistry another, etc. At present, medicine needs overhauling just as much as, if not more than, dentistry. If we put the needs of the medical profession and the dental profession in second place and the need of the public for total, efficient and obtainable health service first, we immediately recognize how ridiculous it is to go on segregating dentistry. It is just as important that society have competent treatment of its dental disease as of its eye, ear, nose or throat ills. It is just as important that the service be rendered by well-educated, well-trained, well-mannered individuals. Certainly no objectively thinking group would place all ills except those of the mouth and jaw in one compartment.

A revamping of our educational system, which is not an entirely new idea, would result in many benefits besides those referred to in this paper.

Reference to the literature in the field of general education reveals the fact that educators are not in complete accord with our present plan requiring eight years of elementary schooling, four years of high school, four years of college and one year for the work leading to the master's degree. Recently, Robert Maynard Hutchins,[11] president of the University of Chicago, was cited in the press as advocating a revision of the requirement leading to degrees in general education. In his book, "The Higher Learning,"[10] President Hutchins deplores the chaotic condition existing in colleges where the first two years are recognized as belonging to general education and the last two years to specialization. He advocates making the break in training at the logical point, when general education is completed, which is at the end of the present sophomore year. To bring this about, the elementary period would be reduced to six instead of eight years.

The following four years of high school and four years of college would bring the candidate up for his bachelor's degree at the end of the general education years, two years earlier than at present. The specialization period leading to the master's degree would then normally require three years of further study instead of the present nonsensical one year. Study for the professional or doctorate degrees would require three more years.

This program, designed primarily to put the colleges on a sound educational basis where they could expend their effort entirely on providing a general education without becoming involved in specialization or being forced by professional schools to provide preprofessional courses, would offer the professional schools a great opportunity to adjust their programs to the changing conditions and the rapidly increasing fund of knowledge. Dentistry could fit into such a picture naturally and her present serious problems would take care of themselves. Highly desirable, but more extensive changes would be necessary in adjusting medical education.

If we were to adopt the suggestions of President Hutchins, applicants for any branch of health service would have the same general type of preparation. All would have six years of elementary school, four years of high school, four years of college and three years of special work, including the biologic sciences which now constitute the first two years of medicine and dentistry. This study would lead to the master's degree and the student, upon completing college, would be but one year older than under the present scheme. With this common background and with this opportunity to discover his interests and abilities, the student would apply for three years of training in the specific field of his choice, be it dentistry or ophthalmology or pediatrics. At the end of this time, he would receive the doctor's degree with citations in a special field and would be prepared to start in practice and render a service to society at a considerable saving of time and with a chance of society's receiving more and better service than at present. Dentistry would have an equal chance to attract well-qualified students, the basic science preparation would be identical and funds for education and research in the health fields would not be made available to all other branches, to the exclusion of dentistry, as at present.

Dentistry is inclined to be very critical of itself, and that is a wholesome sign, but the fact remains that dentistry is doing a comparatively good job of training practitioners to care for present dental needs. Dentistry is the one branch of health service in which this country leads the world. Further advance in dentistry awaits a readjustment of medical education in the whole scheme of education and public health service. Dentistry needs to become integrated with health service, but not absorbed by medicine.

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# FRACTURE OF THE JAWS

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THE present speed in transportation on our crowded highways, together with the increasing speed in transportation facilities both by land and by air, and the highly mechanized equipment of our industrial enterprises have been responsible for a great increase in the number of fractures of the jaws. Correct treatment of these fractures has a definite relationship to the normal occlusion of the teeth, and, in a great number of these cases, the facial appearance of the patient is involved.

## HISTORY

Whatever has been written on the subject, fracture of the jaws remains of particular interest to all practitioners of oral surgery. The interest lies in the ability of the dentist to apply one or more of the many methods available in making the patient comfortable after the accident, and then to execute the best possible plan to reduce the fracture and to effect healing in a minimum time.

Fractures of the jaws are as old as the human race, but the scientific literature on the subject begins with the writings of Hippocrates in the Fourth Century B.C., when he classified fractures as complete and incomplete. It is of interest to note that the principles which he adopted in that era are basic to those which we adhere to today. In order to retain fragments of bone in the normal position, Hippocrates ligated the teeth along the line of fracture, using gold wire and linen thread. In the more complicated cases, he devised and used straps of leather fixed to the chin and drawn tightly over the occipital and superior borders of the head. Herein lies the origin of the various wiring methods and bandages and headcaps which dental surgeons have contrived and used advantageously from time to time.

More than 400 years later, about 40 B.C., Celsus, modifying the Hippocratic method, introduced the sling for the chin in the treatment of fractures. About eighty years later, Galen devised a bandage which covered the chin and was wrapped over the crown of the head and back of the neck. From this, the Barton or Gibson bandage and many modifications thereof evolved. Through the ages, many valuable contributions were made, and, in the eighteenth century, Fauchard, because of his knowledge in the field of prosthesis, contributed generously to the treatment of fractures. Bunon, during the same period, displayed superior skill when a section of the mandible was lost owing to trauma, filling this space with a piece of ivory which was held in position by a wire attached to the proximal teeth. Fixation was established and the fracture healed in one month.

The dental profession is indebted to Thomas L. Gilmer for the metal arch bar which he successfully applied to the buccal and labial surfaces of the teeth in the treatment of fracture of the jaw. In 1887, he conceived the idea of holding the bar in position by means of interdental wires. In this way, the fragments of bone were forced into their normal positions and fixed as the wires were twisted about the teeth when pres-

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**Fig. 1.—Compound fracture following removal of mandibular third molar. There was no displacement and the fracture was reduced by figure eight wiring. Continuous loop wiring can be used.**

**Fig. 2.—Spiral fracture.**

sure was applied to the bar. He then applied intermaxillary wires, which, when twisted, brought the superior and inferior teeth into normal occlusion and thereby established maxillary-mandibular immobilization. The intermaxillary wires were removed from time to time for the purpose of prophylaxis of the oral cavity and the wires were replaced to resume fixation. Gilmer's contribution to the re-

duction of fractures, which has proved to be one of the greatest innovations ever conceived, seems to be one of the most flexible and satisfactory methods available when sufficient teeth remain in the dental arch. In describing reductions by this method, I shall use the term interdental splint because of the modifications which had their origin in the Gilmer splint conception.

Equal credit is due to Angle, Lane, Kingsley, Brophy, Frew, Lyons, Logan, Lucas, Ivy, Winter, Preston and others, who have made valuable contributions to the treatment of fracture of the jaws, and some of whom have devoted much of their lives to instructing students in this special field of surgery.

The value of reference to the old and original writings on the subject of treatment of fracture of the jaws cannot be overemphasized. The student of today is apt to conclude that contributions to this interesting subject have been made only during his lifetime. It is to his interest to familiarize himself with the old masterpieces lest he fail to realize that they are the very basis on which present-day science rests.

### CLASSIFICATION OF FRACTURES

Fractures of the maxillae are classified according to the literature as follows:

Fig. 3.—Comminuted fracture.

Simple, when the integument remains closed or entire.

Compound, when the fracture produces an open wound, communicating with the mouth, the vestibule or the face. (Fig. 1.)

Linear, when two or more lines of fracture have the same direction.

Spiral, when the line is winding or threadlike. (Fig. 2.)

Fig. 4.—Impacted fracture; posterior fragment elevated. The molar was not removed.

Fig. 5.—Complicated fracture; posterior fragment elevated, molar serving as splint.

Greenstick, when the bone is partly broken or bent.

Comminuted, when the bone is broken into two or more pieces or is shattered. (Fig. 3.)

Impacted, when one part is driven into another. (Fig. 4.)

Complicated, when adjacent structures have been injured. (Fig. 5.)

## ETIOLOGY

Fractures of the maxillae are caused most frequently by automotive and industrial accidents. Fights, falls, wrecks,

Fig. 6.—Edentulous case.

Fig. 7.—Fracture from gun shot.

storms, horse or mule kicks, bullets and gunshots contribute to the causes. Fractures may follow osteomyelitis or other pathologic necrosis; or fractures may occur when teeth are extracted.

In an effort to ascertain the significance of the position or location of these fractures, I have made a tabulation of the histories of cases treated. Fracture of the mandible occurs thirty times as often as fracture of the maxilla, in all probability owing to its vulnerability and mobility. The body of the mandible in the bicuspid and molar area is fractured more frequently than any other area. The percentages are: bicuspid and molar

Fig. 8.—Treatment of simple fracture with interdental splint. Intermaxillary elastic bands replaced wires.

Fig. 9.—Treatment of simple fracture with figure eight wiring.

area, 29; cuspid area, 21; angle, 21; symphysis, 14; neck of condyle, 6; ramus, 4; coronoid process, 3; sigmoid notch, 2.

In the maxillae, the percentages are: body, 60; zygoma, 18; mandibular fossa, 13; malar bone, 9.

In this series, 46 per cent of fractures were compound, 19 per cent were comminuted, 10 per cent were greenstick,

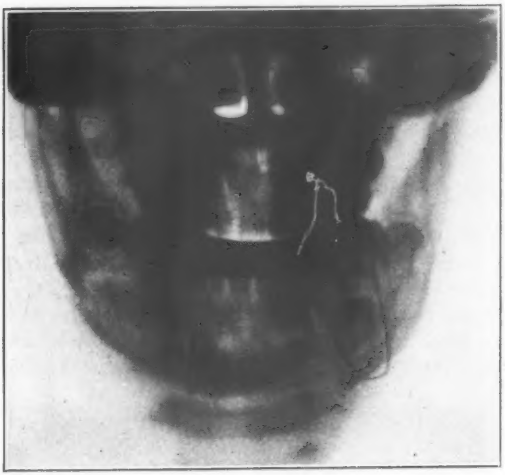

Fig. 10.—Vulcanite splint fixed by means of circumferential wiring to mandible of patient 5 years of age.

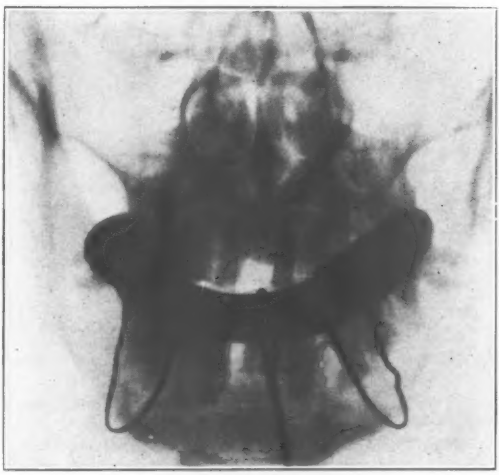

Fig. 11.—Vulcanite splint fixed by means of circumferential wiring. With trocar and cannula, 20-gage pure silver wire was placed around the splint from the occluding surface to the inferior border of the mandible. The wires are twisted together as the parts of the jaw are pushed into normal relationship.

9 per cent were simple, 8 per cent were juvenile and 8 per cent were in the edentulous.

### SYMPTOMS

The signs and symptoms of fracture of the maxillae are swelling, pain, tenderness in circumscribed areas, mobility of the fragments, bleeding, ecchymosis, crepitus, malocclusion of teeth and an abnormal mandibular-articular relationship.

### DUTY OF THE DENTAL SURGEON

The general practitioner, to whom these patients frequently come for attention, is obligated to acquaint himself with the fundamental principles of treatment involved. His knowledge of the anatomy of the maxillae, the teeth and their associated structures and the temporomandibular relationship qualifies him to meet the emergency. Because he has digital dexterity and is accustomed to operating within a small field, he should be able to make a diagnosis and have little or no difficulty in ascertaining what is needed to reduce the fracture. One must see with his eyes and feel with his fingers when making a survey of the jaws. With the assistance of bilateral extra-oral roentgenograms, he can arrive at a diagnosis, and can then determine the method of treatment. If the dentist to whom the patient has come for attention does not include treatment of fractures in his practice or he decides that a case is too intricate for him, it is his duty to refer the patient to more competent hands for attention.

### EXAMINATION AND TREATMENT

The clinical examination and a study of the roentgenographic findings are necessary for arriving at a diagnosis. A study of the occlusion of the teeth and the facial relationship is necessary in many compound fractures. If the patient has been in a wreck or has otherwise met with violence, a routine physical examination should be made to determine the general condition. Tetanus antitoxin serum (500 units) should be administered as a precautionary measure. Ice packs should be applied to the affected areas in order to reduce swelling to a minimum and alleviate pain. In the more complicated cases, morphine one-fourth grain and atropine one one-fiftieth grain should be administered. This dosage is for a patient weighing approximately 150 pounds.

By checking the subjective symptoms

Fig. 12.—Complicated fracture in patient 5 years of age. The posterior fragment on one side is raised up laterally. The anterior section of the mandible is pushed downward. A vulcanite splint made it possible to push the fragments into normal relationship when, by means of circumferential wiring, fixation was established. The patient could open and close the mouth during the entire period of healing. Figure 11 illustrates perfect reduction.

manifested by swelling, pain or bleeding, and the objective symptoms, evident in malalinement of teeth, bone movement or an abnormal relationship of the articular processes, a satisfactory diagnosis can be made. The mouth should be made as sanitary as circumstances will permit, by removing all salivary and serumal accretions from the crevices of the teeth and all foreign particles, such as loose filling material and pieces of teeth, from the mouth.

At this time, one should determine what method is to be employed in the reduction of the fracture and what anesthetic will best suit the case in hand. Each case presents a different problem, and the success attained in treatment is in direct ratio to the ingenuity exercised by the dental surgeon.

ANESTHETICS

In order to prepare the patient with the greatest amount of comfort, and to facilitate the procedure, an anesthetic should be employed. Preoperative sedation aids materially in securing complete relaxation of the patient.

Some members of the dental profession believe that injection of a local anesthetic may cause tissue lesions, with postoperative discomfort. For this reason, some practitioners advocate general anesthesia to avoid what they term abnormal trauma. I have used conduction anesthesia extensively with no postoperative ill-effects, and having the patient conscious during operation has, in many cases, proved a help rather than a hindrance.

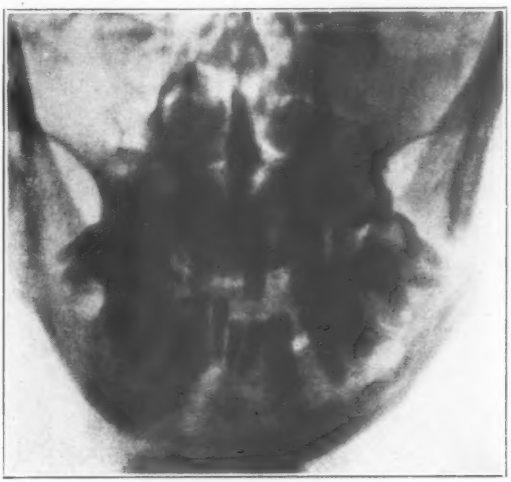

Fig. 13.—Fracture from osteomyelitis; bilateral compound irregular fracture of six months' standing. There was a suppurating sinus at the lower border of the mandible near the left cuspid area. The medial fragment was displaced downward about one-fourth inch. Slight callus was present in the line of fracture. A fracture of the body of the mandible anteriorly from the angle showed some displacement and some callus present. A vulcanite splint was made (Fig. 11) to correct the fracture. Under bilateral mandibular conduction anesthesia, a surgical break was made at the anterior line of union by means of bone chisels under mallet pressure and the fragments were placed in normal relationship. The posterior line of union was not broken, but was manipulated much as a greenstick fracture. The splint was put in place and, by means of circumferential wiring, was fastened to the mandible. Postoperative care was necessary for two months, when sufficient osteogenesis had occurred and the splint was removed.

Fractures of the jaw, which are trau-

matic lesions, are accompanied by irregularity in muscle attachment, blood supply and fiber attachment. Because trauma causes a disturbance of the vasomotor function, characterized by muscle spasms, the sensory impulses are best controlled by a vasoconstrictor. Through diminishing the local blood supply to the affected area by conduction anesthesia, the treatment of fractures can be expedited and edema and pain be reduced to a minimum.

Inhalation anesthesia is almost invariably contraindicated in the reduction of fractures of the jaw when maxillary-mandibular fixation is required. If, however, the fractures can be reduced in either jaw, or in both jaws under general anesthesia, and the intermaxillary relationship can be achieved in twenty-four hours or more, the necessary precaution has been taken against vomiting, which often follows administration of a general anesthetic.

Granting that conduction is the anesthesia of choice, anesthesia by inhalation, i.e., ether or cyclopropane, or pentothal sodium anesthesia by intravenous injection, will enable the surgeon to cope with any of the many complications and thereby keep the patient comfortable and controllable. In order not to prolong the operation, the dental surgeon should have a competent assistant to relieve him of the duties of aspirating moisture from the mouth and retracting the lips and cheeks in order to maintain accessibility, and to assist, where the need arises, in reduction of the fracture.

**Fig. 14.**—Open reduction of fracture of mandible. Metal screws were driven into each section of the mandible and then pulled together. Because the screws were placed too near the line of fracture, the small section of bone on the mesial fragment gave way under pressure. Osteomyelitis followed. By means of a vulcanite splint wired circumferentially, satisfactory reduction was achieved.

### SPLINTS

There is, and I am free to speculate that there always will be, some confusion as to what type of splint is to be used in reduction of certain fractures.

Some authors contend that no theoretical treatment for the reduction of fractures of the jaw can be of much assistance to the dental surgeon unless the various types of jaw fractures are properly classified. This is true, if the

cardinal principles of treatment are effectively applied. Herein lies the danger of inefficient treatment, and caution is here given that any particular technic should not be accepted as an assurance of success. Frequently, the successes cited omit the difficulties which all practitioners encounter at some time. The more fractures one treats, the more convinced one becomes that the type of splint to be used is usually governed by the kind of fracture and the type of patient.

interdental wiring. The advantage of the splint over the figure eight wiring or the interdental wiring is that, in some cases, mandibular-maxillary fixation is not required in order to reduce this type of fracture. Figure 1 illustrates a compound fracture which usually requires more than the simple wiring here employed. The mandible was wide and the fragments did not change position when they were brought into the normal relationship.

Fig. 15.—Fracture of neck of condyle. An interdental splint, a headcap or a combination of extra-oral and intra-oral splint can be used to attain maxillary-mandibular fixation.

By way of illustration, certain successes and failures will be cited. Simple fracture was treated with the interdental splint as illustrated in Figure 8. Small wires can be twisted between and about the teeth in the form of a figure eight in order to prevent the parts from moving during the healing period. (Fig. 9.)

Compound fractures can be treated by means of an interdental splint or

Comminuted fractures of the jaw, which present many different and difficult problems, can be treated in many ways. When encountering the more complicated ones, I have made a small rim of vulcanite or acrylic material to cover the occlusal surfaces of the remaining teeth or the crest of the mandible. This is done by securing a workable cast and making the adaptations used in the proc-

ess of prosthesis. The splint is then fixed by means of circumferential wiring. (Fig. 10.)

Only after treating fractures for years did I learn the method of circumferential wiring, in collaboration with Dr. Frew in cleft palate, cleft lip and other plastic surgery of the mouth.

Reducing a fracture by means of circumferential wiring requires surgical, or at least anatomic, skill and judgment. The promiscuous or indiscriminate use of this method in untrained hands will discredit a method of inestimable value.

Impacted fractures are sometimes resistant to treatment. When the fracture is posterior to the first or second molar in the mandible and there are no teeth to which a splint can be attached, it is sometimes difficult to reduce the fracture if the posterior fragment has become elevated.

Fractures having their origin in osteomyelitis require proper coaptation of the parts after surgical cleanliness and a normal relationship has been achieved. (Fig. 13.)

Open reduction of fractures of the mandible is less often indicated than many general surgeons seem to realize. Figure 14 illustrates some results of this error. I shall not list the cases which have been treated in this manner—those cases in which an operation was performed either immediately after the fracture occurred or at a later date, when osteomyelitis appeared. It is not intended to condemn this method of reduction of fractures, but, on observation, one may learn that, aside from the unsightly cicatrix, too many cases result in malalinement of the teeth or osteomyelitis. Metal screws (vitallium or ticonium) have proved to be a successful adjunct to reduction of fractures of other long bones of the body.

Fig. 16.—Fracture of zygomatic process. Wiring the fragments or applying the tractor used in reducing neck fractures will effect healing. Drilling holes into either fragment to allow 20-gage pure silver wire to pull the parts together is not only a simple method, but also one which has been used over a long period of time. The tractor, a comparatively new instrument, gives good results when applied properly.

Fractures of the articular process are frequent. (Fig. 15.) The clinical picture of a bilateral fracture of the condyle is deplorable. The mandible, because muscles of mastication are beyond voluntary control, is pulled backward and upward. In many cases, the coronoid process fractures on the same side,

independently of the condyloid process. The reduction of fractures of the coronoid or the condyloid process requires maxillary-mandibular fixation after the parts have been forced into normal position by digital pressure.

The reduction of fractures of the malar bone is achieved by maintaining the fragments in normal position with one of the many different splints.

In reducing a fracture of the zygomatic process (Fig. 16), it is sometimes necessary to make an external incision, in order to adapt the ends of each fragment. Sometimes, it is best to hold these fragments in normal position by means of wires.

The reduction of edentulous fractures is facilitated if the patient has artificial dentures. All that is needed is to place the dentures in position and apply either a head cap or a jaw brace, or to establish fixation of maxillae and mandible by means of a Barton or a Gibson bandage. If dentures are not available, splints can be used. In less complicated cases, the fragments may be forced into normal position as a tray filled with soft compound impression material is placed in the mouth. Care must be taken that the tray containing the compound material is suited to the natural contour of the jaw, and a bandage or head cap then adapted.

In gun shot cases, if the mandible is considerably damaged (Fig. 7), usually all particles of bone and foreign material are removed. Surgical cleanliness being attained, we depend on sufficient osteogenesis for healing. I have treated these cases daily for as long as from ten to fifteen days prior to introducing some type of splint by which reduction was attained.

### EXTRACTION OF TEETH IN LINE OF FRACTURE

A much debated question in the reduction of maxillary fractures is whether teeth in or near the line of fracture should be removed prior to the application of the splint. Except in horizontal fractures near the crest of the maxillae, I have been quite conservative and even reluctant to remove teeth in the line of fracture. Frequently, the questionable tooth may serve as a splint for a time. By eliminating the third molar as a possible splint, the surgeon may precipitate complications wherein the pterygoid masseter and temporal muscles elevate the posterior fragment, when a modified splint must be employed.

### POSTOPERATIVE TREATMENT

One of the principal requirements in the reduction of fractures of the jaws is not only to create cleanliness and drainage, but also to maintain them throughout the treatment. Frequent prophylactic treatments and the use of a suitable mouthwash will keep the mouth in a sanitary condition, and unless the mouth is kept clean, infection may develop.

The patient must have sufficient food, and, if necessary, should be fed at frequent intervals in order to retain the normal body weight. A high calcium and phosphorus diet should be prescribed. One of the easiest to prepare and administer is cod-liver oil 2 drams in 8 ounces of orange juice; or the yolk of two fresh eggs in 1 pint of milk. Others are beef broth, fruit juices, vegetable juices, etc. Sea foods are good dietary aids. A soft diet, which may include a larger group of foods, can be taken when there is no mandibular-maxillary fixation. The patient should rest lying down in order to keep in good health.

### CONCLUSION

With an increasing number of cases of fractures of the jaws, the dental profession has new problems, and because there are so many kinds of fractures, the treatment is variable. Carelessness not only results

in serious complications, but the physiognomy of the patient may be marred inconceivably. Having treated more than 700 cases, I am convinced that the best results are achieved by adhering rigidly to definite preoperative, operative and postoperative measures.

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# ROENTGENOLOGIC AID IN THE DIAGNOSIS OF ANGIOMA

By JOSEPH SCHROFF,* M.D., D.D.S., New York, N. Y.

ANGIOMA may occur in any part of the body, but when occurring on the face, lip, tongue, palate or gum is of special interest to the dentist. The diagnosis of angioma when it involves the superficial tissue of the mouth or skin is easy. (Figs. 1, 2 and 3.) Difficulties in diagnosis arise, however, when the angiomatous mass is covered by normal mucous membrane. In these instances, the mass or swelling is usually diagnosed either as a soft fibroma or as a cyst. (Fig. 4.) Aspiration of the mass or palpation for pulsation may be helpful in making the diagnosis.

Two cases of soft swelling about the face and jaw seen recently are considered, because of the roentgenographic findings, to be of sufficient interest to the dental profession to warrant this paper.

Fig. 1.—Hemangioma of lip.

Fig. 2.—Hemangioma of tongue.

These cases were referred to me for sialographic studies and diagnosis. In a previous report on sialography,[1] I pointed out that sialograms are very useful, not only in the diagnosis of recurrent swelling, salivary stones, cysts and mixed tumors and malignancy of the salivary glands, but also in determining the position of the swelling as related to that of

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the salivary gland and also in determining whether the lesion is intraglandular or extraglandular.

### REPORT OF CASES

CASE 1.—A girl aged 18 had a painless soft swelling of the left side of the jaw, extending from behind the angle of the jaw forward to the midline, and from above the lower border of the mandible downward over the submaxillary area. The swelling had been present for three years. It was thought to have started after the extraction of a lower molar tooth. Aside from the disfigurement it involved, no complaints were registered.

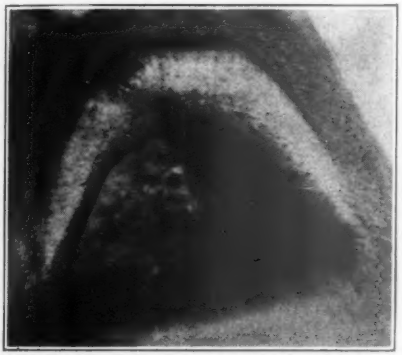

Fig. 3.—Hereditary hemorrhagic telangiectasis, with bleeding from palate, in patient aged 45. Examination revealed several areas of small angiomata on the lips and hard palate. The father and two brothers of the patient have similar conditions.

Fig. 4.—Angioma of upper lip (tentative diagnosis, soft fibroma or fibrolipoma). Treatment was surgical, followed by radium application.

CASE 2.—A man aged 20 applied for admission to the Naval Aviation Corps and was found to be in good physical condition except for a moderate soft painless swelling on the left side of the face near the angle of the jaw. A mixed tumor or cyst of the parotid gland was suspected.

As a preliminary step for sialography, lateral and anteroposterior roentgenograms of the jaw were taken in both cases. The roentgenograms in each case revealed small oval-shaped radiopaque areas of various sizes, and also one or two larger areas that had a radiopaque nucleus around which there was a zone of radiolucency surrounded by a

Fig. 5 (Case 1).—Cavernous hemangioma (diagnosis confirmed by pathologic examination of mass after surgical removal).

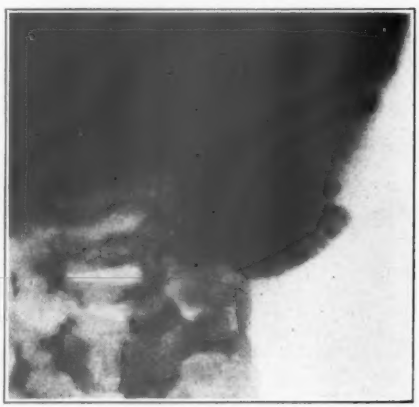

Fig. 6 (Case 1).—Sialogram showing submaxillary gland and characteristic phleboliths.

concentric ring of radiopacity. These cases were diagnosed as cavernous hemangioma.

Pathologic calcification has been frequently noted in association with disorders of the vascular system, especially in the pelvic region in the prostatic and uterine plexus. It has also been observed in other parts of the body, such as in the superficial veins of the legs, and occasionally in association with angioma from subcutaneous and muscular regions. The

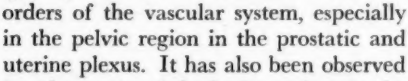

Fig. 7 (Case 2).—Cavernous hemangioma of face (parotid region).

Fig. 8 (Case 2).—Roentgenogram showing characteristic phleboliths.

calcium is deposited in the lumen of the vessel after a thrombus has formed. This calcified thrombus forms the nucleus around which further concentric layers may be deposited. The concretions within the blood vessel are termed phleboliths. The roentgenographic findings, according to Khoo,[2] depict fairly well-rounded or oval-shaped concentric rings of radiopacity which vary in size from that of a pinhead to well over a centimeter in diameter. Some may appear as homogeneous bodies, but the majority show typical concentric rings. The nucleus is usually radiopaque, and it may be round, rosette, cart-wheel or kidney shaped. Sometimes, the center may be radiolucent instead of radiopaque. Around the nucleus is a zone of radiolucency, which is surrounded by a

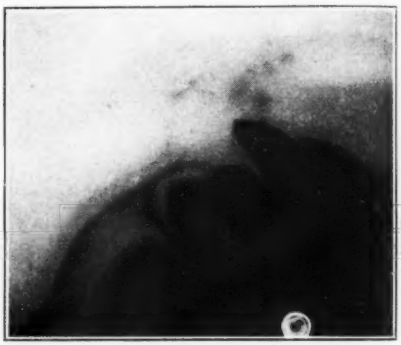

Fig. 9 (Case 3).—Lower teeth and calcified round areas in lower lip.

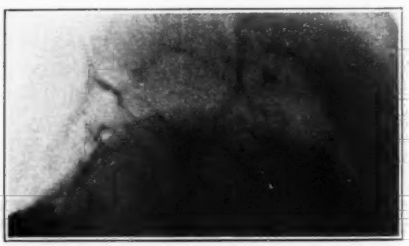

Fig. 10 (Case 4).—Capillary hemangioma of jaw.

concentric ring of radiopacity. The ring is of various thickness and may not be homogeneously dense; or it may be defective in some sections. These external rings usually possess sharp outlines in contrast to the usually blurred ones of the nuclei. There may be three or four such concentric rings in a large nodule. The entire nodule is usually round or

oval, but bean, oblong or other irregular shapes also occur.

An obscure soft swelling displaying such concentric shadows (phleboliths) can be safely diagnosed as angioma with calcification.[3]

Angioma may occur in any organ or in any part of the body, but there seems to be a greater predilection for the upper half of the body, especially the neck, upper forearm and hand. The foot seems exempt, with the face and trunk less affected than the arms and legs. In the youngest patient, a 2½ year child, the angioma was in the hand. The incidence of phleboliths in angioma is about 2-3 per cent (Pulford-Khoo[4]). No age is exempt, although the greatest percentage occurs in the second or third decade of life. Most writers, in speaking of phleboliths, agree that the "calcareous deposit is not within the wall of the blood vessel, but occurs only in the fibrous mass of organizing blood clot."[5]

That the incidence of calcification in angioma might be greater if all cases were roentgenographed is shown by the following cases.

CASE 3.—A 7½ months infant was referred for an opinion regarding a "bluish lesion" on the inner surface of the lower right lip. The lesion was soft and about a centimeter in its longest diameter. Ordinarily, a roentgenogram would not have been taken since the lesion had all the clinical appearances of an hemangioma, but because the parents seemed worried about the teeth, a roentgenogram was taken. A series of small round radiopaque dots were revealed, above the level of the unerupted deciduous teeth.

CASE 4.—A woman aged 77 had a swelling and asymmetry of the face localized in the region of the symphysis of the lower jaw. The swelling seemed to follow removal of a lower anterior tooth, which had been very loose for the past four or five months. The swelling, about 4 cm. in size, seemed attached to the alveolar border. Clinically, a provisional diagnosis of adamantinoma was made by the examining dentist, but after the roentgenogram had been studied, the diagnosis was changed to capillary hemangioma of the mandible.

In the differential diagnosis of areas of increased density in soft tissue (roentgenogram), we must always consider calcified tuberculous glands, calcified hematoma, calcified granuloma or a small tumor of the skin, calcified parasites, osteoma and myositis ossificans. Neither should metallic foreign bodies be overlooked. The clinical history and laboratory findings will usually determine the diagnosis.

The treatment of angioma has in the past been surgical eradication. Except for certain selected cases, surgical treatment has now been superseded by radiotherapy or the use of sclerosing fluids.

## CONCLUSION

Obscure soft swellings about the face are occasionally produced by angioma. Roentgenograms of soft swellings displaying characteristic calcified structures are diagnostic.

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# PULP CAPPING IN DECIDUOUS TEETH: REPORT OF A TEN YEAR STUDY

By S. N. ROSENSTEIN,* B. S., D.D.S., New York, N. Y.

THE consensus of opinion of most authorities on dentistry for children is that pulp capping in deciduous teeth is generally contraindicated and unsuccessful.[1] The results of clinical studies conducted by the author in the Division of Dentistry for Children, School of Dental and Oral Surgery, Columbia University, have proved this contention to be unfounded.

This widespread and persistent negative attitude prompted a perusal of the early literature on pulp capping for evidence to condemn its practice in deciduous teeth.

The earliest published reference to pulp capping was found in "The Principles of Dental Surgery," by Leonard Koeker, published in 1826, which presents what appears to be a careful and sound method of pulp capping in permanent teeth. However, referring to pulp exposure as "caries of its complicated stage," Koeker concludes a chapter in this book with the statement that "it is scarcely necessary to add that if caries has arrived at its complicated stage in any of the temporary set of teeth, they should be extracted without delay as every attempt at their preservation would be injurious and success impossible."[2] No subsequent recorded reference to pulp capping in deciduous teeth could be found up to August 1864. At a meeting of the American Dental Association, in a discussion of treatment of deciduous teeth in children under 10 years of age, it is reported that:

> Doctor Magill believed that the extraction of temporary teeth would sometimes injure, or even entirely destroy, the permanent ones beneath, and was strongly in favor of their preservation. He hesitated to employ arsenic for the destruction of pulps of deciduous teeth, but had been in the practice of covering the exposed surface with wax, moistened on one side with creosote, and capping the whole with a metallic filling; several months' experience in such treatments has proven very encouraging.[3]

No further contributory evidence from Dr. Magill was found, but it appears that his was the first voice lifted in favor of pulp capping in deciduous teeth.

During the next few years, the reports seem to favor dentistry for children, but no mention is made of pulp capping until 1870, when Crouse, of Illinois, is recorded as being opposed to destruction of the pulps of deciduous teeth.[4] Flagg, in 1877, is recorded as favoring extirpation of exposed deciduous pulps.[5] However, Dr. Atkinson, in 1879, at a meeting of the First District Dental Society, New York, stated, in his discussion on the capping of deciduous pulps, that "by all means the pulps should be kept alive."[6] No specific procedure is mentioned, but he advocated pulp capping in preference to extirpation.

To facilitate a review of important recent literature, intervening references which refer principally to the permanent teeth are omitted. A noticeably increasing interest in operative procedures pertaining to dentistry for children is shown by the publication of several approved

Read before the Section on Children's Dentistry and Oral Hygiene at the Eighty-Third Annual Meeting of the American Dental Association, Houston, Texas, October 29, 1941.

*Assistant professor of dentistry, School of Dental and Oral Surgery, Columbia University.

textbooks and numerous articles in dental periodicals. Foster's summary in 1936 demonstrates that most of the opinions expressed were virtually in agreement regarding the management of exposed pulps in deciduous teeth. He says: "Another reason that it is advisable to devitalize teeth if the pulp is exposed is that not one of the eighteen references consulted suggests pulp capping, even though the tooth is uninfected, and eleven of the eighteen definitely advise against it, reporting only failure where it has been attempted."[1] Again, in the summary, he says, "Pulp capping in deciduous teeth is absolutely contraindicated."

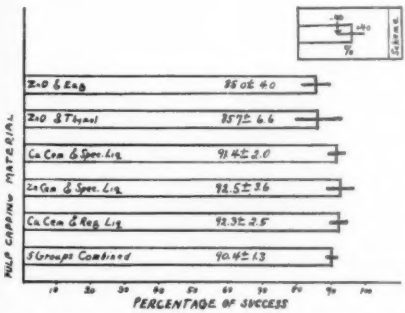
Zn O & Eug
Zn O & Thymol
Ca Com & Spec. Liq
Zn Com & Spec. Liq
Ca Com & Reg. Liq
5 Groups Combined
PULP CAPPING MATERIAL
PERCENTAGE OF SUCCESS

CHART 1. PERCENTAGES OF SUCCESS FOR 5 LARGER PULP CAPPING GROUPS, AND FOR ALL GROUPS COMBINED.

Figure 1.

The writers referred to unanimously agree that exposed pulps in deciduous teeth cannot be capped successfully. Some believe that the inability of the deciduous tooth pulp to form secondary dentin because of its participation in root resorption militates against successful capping.[7] However, some admit that a reasonable degree of success can be expected when exposure occurs accidentally during cavity preparation and not during excavation of deep decay.[8, 9]

In 1936 and 1937, I published preliminary reports of studies then in progress on statistical results and procedures in successful pulp capping in deciduous teeth.[10, 11] Coolidge, in 1937 and 1939, wrote that the treatment of deciduous teeth involves no different method from that of treatment of permanent teeth, agreeing that capping of deciduous tooth pulps should be attended by a high degree of success.[12, 13]

This report includes 628 cases representing one group of cases of pulp capping in deciduous teeth. It is part of an extensive clinical study in tooth conservation conducted from 1931 to 1940 inclusive in the children's dental clinic of the School of Dental and Oral Surgery, Columbia University.

Most of the cases were treated by senior dental students under the supervision of, or with the assistance of, members of the staff. Individual roentgenograms were taken either during treatment or upon its completion. With few exceptions, dryness of the operative field was maintained by the use of size 0 cotton rolls, cut in about 1 inch lengths, and small saliva ejectors. Occasionally, a rubber dam was used. Each case was recorded on a separate index filing card, on the patient's clinic chart and also in a large group record.

## CLINICAL INDICATIONS FOR PULP CAPPING

The two criteria required in the selection of cases for pulp capping were (1) sensitivity to the touch and (2) hemorrhage at the point of exposure, in vital teeth with pulp exposures. These criteria indicate the vitality of pulps exposed during either cavity preparation or excavation of carious dentin.

An examination of the records of 200 successful cases in our files showed surgical exposure of almost 15 per cent (i.e., inadvertently made by excessive cutting with the bur) and in the remaining approximately 85 per cent, carious exposure (i.e., occurring during the removal of deep decay). About 14 per cent of the cases of carious exposure presented unfavorable prognoses at the time of capping. They had single large exposed areas, some about 1 mm. in diameter,

indicating that decay had been extensive enough to produce incipient degeneration of the pulp horns. Early in our study, pulps exposed to this extent were deemed unfit for capping and were usually treated by pulpotomy. Later, as the data showed increasing success with cement capping agents, pulp capping was performed in many of these apparently unfavorable cases. A small number of these, some surgical and others carious in origin, were exposed at two horns sufficiently deep axially and gingivally to include a narrow band of exposed pulp about 2 to 3 mm. in length in the proximal area of the pulp chamber at or near the bifurcation of the buccal and lingual pulp horns. Here, the cement capping materials were very practical and protective agents.

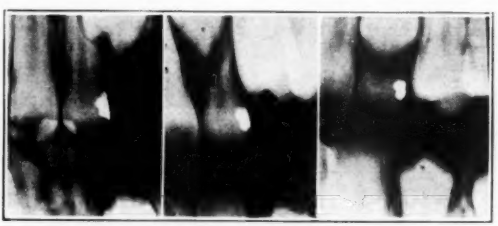

Fig. 2 (Patient A. S.).—Pulp capping of upper left deciduous cuspid with thymol and zinc oxide, March 10, 1936, at the age of 9. Left to right: Views taken March 10, 1936, December 23, 1937 and June 23, 1938. The pulp-capped tooth is ready to be exfoliated. The time of its serviceable retention was twenty-seven months.

### PROCEDURE FOR PULP CAPPING

Following are the steps in pulp capping.

1. Remove gently all carious dentin near the area of exposure.

2. Thoroughly wash and dry the cavity. Apply phenol and repeat the drying.

3. Apply the capping material. (Table 1.)

4. Complete the cavity preparation and place the permanent filling.

5. Roentgenograph the area.

The operative procedures should be carried out gently to avoid trauma to the pulp. The excavation instrument may be a fairly large round bur or spoon excavator and must be sharp. The phenol should be applied on a small cotton pellet and may be either the 95 per cent solution or phenol compound (Buckley's). The phenol is allowed to remain in contact with the exposed surface for one to one and a half minutes and should not be followed by alcohol. It is best dried by gentle blasts of warm air, after most of the excess phenol has been removed by cotton pellets. The capping material must be applied gently. Cement for capping is more easily manipulated if only a small amount is applied with a small instrument. The base is thus readily formed and trauma incidental to removal of excess is avoided. The cavity preparation when completed must meet the usual requirements for the placement of a good filling. This is essential to prevent fracture of the filling and loss of the capping. Silver amalgam was used in all our cases for permanent filling. However, there is no contraindication for a gold or any other type inlay.

### REEXAMINATIONS

All of the cases were recalled for checking twice each year during the May-June period and the December-January period. Each case was checked for clinical and roentgenographic evidence of pathologic involvement by: 1. Noting the condition of the gingival

tissues over the tooth in question. 2. Testing for tenderness on percussion. 3. Inquiring as to pain or discomfort since the previous visit. 4. Using the electric pulp test. 5. Roentgen-ray examination.

Those cases in which the teeth had remained vital, negative to percussion and comfortable since previous checking, with normal appearing gingival tissues, and negative roentgenographically were classified as successful. Those cases in which the teeth showed pathologic involvement clinically or roentgenographically were considered unsuccessful. A

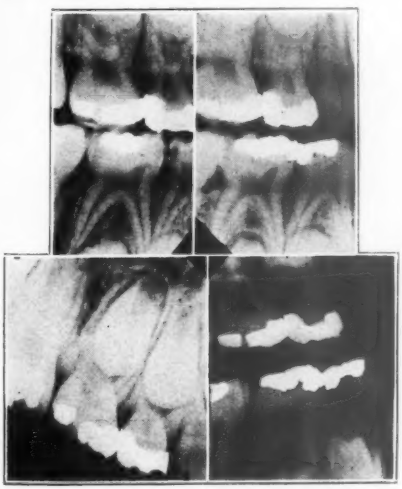

Fig. 3 (Patient E. S.).—Pulp capping of upper right first deciduous molar with red cement and special liquid, February 20, 1934, at the age of 7 years. Above: Left, view taken January 15, 1935. Right, view taken January 29, 1936. Below: Left, view taken January 6, 1937. Right, view taken, March 3, 1938. The tooth was exfoliated July 1938. The length of serviceable retention was fifty-three months.

case previously classified as successful through several checkings, and at a later examination found to be pathologic and therefore unsuccessful, was subsequently reclassified as unsuccessful.

### EXCEPTIONS TO CHECKING CONDITIONS

1. At the time when root resorption is complete and the tooth is ready to be exfoliated, it may still be firmly attached to the gingival tissues all around its cervical region. Because of the extensive resorption, the tooth is quite mobile and movement during mastication irritates the attached soft tissue, causing it to appear inflamed. Under these circumstances, and with the aid of the roentgenogram, this condition can be differentiated from an abscessed or other pathologic gingival involvement.

2. Another exception to the checking criteria is the case of resorption which has progressed to its final or near final stage, the floor of the pulp chamber also being resorbed. No response is elicited from these teeth by the electric pulp tester. On removal, the teeth present the crown forms with open chambers on their resorbed aspects filled with a soft shiny light grayish adherent structure. On histologic examination, this material in the pulp chamber is found to be a mass of epithelial tissue,[14] which replaced the normal pulp chamber contents, apparently after the floor of the pulp chamber was resorbed. This accounts for the lack of response to pulp testing.

### RESULTS

Table 1 shows the data on pulp capping in deciduous teeth grouped according to the materials used. The number of cases classified as successful and unsuccessful in each group, the number of cases in which the patient did not return for reexamination and the total number of cases of pulps capped with each agent are given.

The percentage of success is based on the number of recorded successful and unsuccessful cases in each of the five larger groups. The cases that were not seen again were not included in computing these figures. The total percentage of success (90.4) is based on the successful and unsuccessful cases, totaling 512. Those in which the pulps were capped with silver cement and special liquid and

other agents are included in the totals combined, but percentages for these were not computed, since these groups were too small to be significant for individual evaluation and further comparison.

It is believed that the actual degree of success is probably higher than that reported, because of the likelihood that in the cases which were not seen again, the teeth remained serviceable, functioning and comfortable. In many of the unsuccessful cases, the patients returned voluntarily for treatment or extraction when the teeth became painful or otherwise troublesome. In addition, several patients, after failing to respond to recalls for three years or more, finally returned for reexamination. The teeth were found to be vital and normal and were classified as successful. In a comparison of the percentages of success of the five larger groups, there appears to be a slight advantage in favor of the cements. These values are presented in graphic form in Figure 1. When these values and their standard errors are compared, there is no significant difference. The total percentage of success is 90.4 $\pm$1.3. The relation of this value to its standard error is such that the value can be accepted as highly significant, both statistically and clinically.

There may be no significant difference statistically between any one agent and another. However, clinically, there is a decided advantage in favor of the cement group of materials. This is due to the fact that the cement, when properly mixed and applied, sets quickly, and transmission of pressure to the pulp is thus prevented. With zinc oxide and eugenol, pressure may be transmitted to the pulp during the longer setting period. Another advantage resulting from more rapid setting of cement is that it permits the immediate placing of a permanent filling. Thus, the possible transmission of pressure or other trauma to the pulp through a temporary filling is avoided. Any possible trauma of a chemical nature from the cement is apparently counteracted by the action of the phenol, applied just prior to the placing of the capping agent. The phenol acts as a

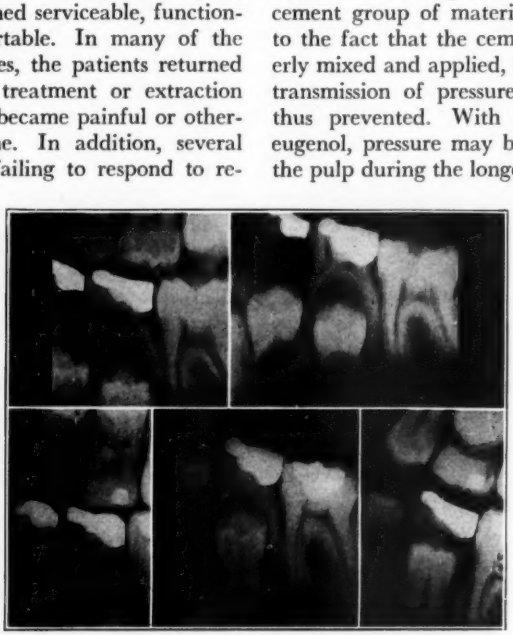

Fig. 4 (B. S.).—Pulp capping of lower left second deciduous molar with red copper cement and special liquid, May 9, 1935, at age of 5. Above: Left, view taken December 30, 1936. Right, view taken December 12, 1937. Below: Left, view taken June 15, 1938. Center, June 14, 1940. Right, February 3, 1941. The time of serviceable retention was sixty-nine months. Resorption occurred close to the crown. The root ends were still present February 3, 1941.

local anesthetic and coagulant[15] to the exposed pulp tissue.

When lack of time may not permit placing the permanent filling immediately after pulp capping, the use of zinc oxide and eugenol as described in the footnote to Table 1 is indicated, rather than a cement pulp capping with a covering of temporary stopping. The cement pulp capping may be dislodged with the removal of the temporary stopping, and the pulp reexposed. While recapping can be done, the accident may result in additional trauma to the pulp.

PERIODS OF SERVICEABLE RETENTION

The success of the pulp capping procedure is further emphasized by the length of time the deciduous teeth were retained as vital, normal, functioning members after pulp capping. (Table 2.) Of the successful cases, over two-thirds were retained for periods of more than one year after pulp capping. In slightly less than half of the successful cases, the teeth were retained for periods of more than one and one half years after pulp capping. As the figures in Table 2 represent the findings up to the last checking period, it is reasonable to assume that many continued to be retained in function and that the periods of serviceable retention lengthened.

The mean length of service for each of the five larger groups is shown; also the mean for the five groups combined. The figure for the red copper cement and regular liquid is somewhat lower than the figures for the other groups. This difference may be due to the fact that this group was included in the study later than the others. The periods of observation of many of its cases were not so long as for some of the cases in the other groups. The mean length of service of the combined group is significant, representing an important period in the life of these teeth. The clinical value of the procedure is further demonstrated by the appreciable number of teeth retained for four, five or six years after pulp capping.

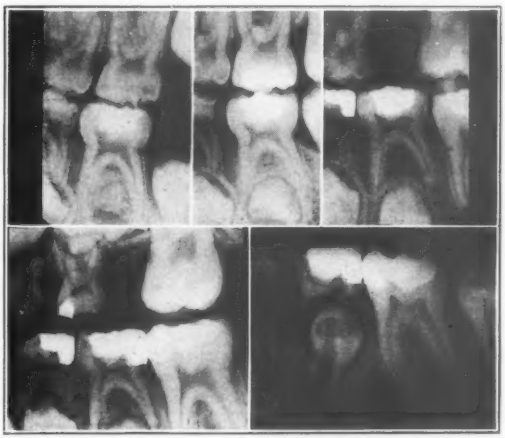

Fig. 5 (R. C.).—Pulp capping of lower left second deciduous molar with zinc cement and special liquid, February 19, 1934, at age of 5. Above, left to right, views taken February 19, 1934, March 20, 1935 and January 27, 1937. Below, right, view taken February 2, 1939; left, May 31, 1940. The tooth was normal. The time of serviceable retention was seventy-five months.

New caries developed in several cases of successful pulp-capping. In some of

these, during extension of the cavity and removal of old fillings, the capped areas were accidentally reexposed. Although this occurred during the second and third years after initial pulp capping, the pulps were found to be sensitive to touch and hemorrhagic. These teeth were recapped and filled, and reexamined regularly. They continued in function, some until exfoliation.

Of the successful cases, 151 were classified as exfoliated or ready to exfoliate. These included fifteen teeth nearing the time for exfoliation and which were extracted for histologic study. They were distributed as follows: twenty-seven were exfoliated during the first year after pulp capping, fifty-two during the second year, twenty-four during the third year, twenty-six during the fourth year, thirteen during the fifth year, eight during the sixth year and one at the beginning of the ninth year. These teeth remained vital and serviceable and root resorption apparently proceeded normally. (Figs. 2-5.)

The unsuccessful cases (Table 3) are also of interest as regards length of serviceable retention. Some were of service for as long as two and one half years after pulp capping. Others failed at one and one half years or less after treatment. During these intervals, they were normal, vital and functioning. The cases were classified as unsuccessful, as there was evidence of pulp destruction. The mean value for the various lengths of service of the unsuccessful cases represents a significant and valuable period of time. Therefore, we believe that our group of 9.6 per cent unsuccessful cases signifies some measures of success clinically and that they were not completely unsuccessful.

TABLE 1.—DATA ON DECIDUOUS TEETH TREATED BY PULP CAPPING

| Pulp Capping Material | Successful | Unsuccessful | Patient Did Not Return | Total | Success Per Cent | Standard Error |
|---|---|---|---|---|---|---|
| Zinc oxide and eugenol* | 68 | 12 | 26 | 106 | 85.0 | 4.0 |
| Thymol and zinc oxide | 24 | 4 | 2 | 30 | 85.7 | 6.6 |
| Silver nitrate cement liquid group† | | | | | | |
| (a) Copper cement and special liquid | 202 | 19 | 60 | 281 | 91.4 | 2.0 |
| (b) Zinc cement and special liquid | 49 | 4 | 12 | 65 | 92.5 | 3.6 |
| (c) Silver cement and special liquid | 3 | — | 2 | 5 | | |
| Copper cement and regular liquid | 106 | 9 | 12 | 127 | 92.3 | 2.5 |
| Other agents | 11 | 1 | 2 | 14 | | |
| Total | 463 | 49 | 116 | 628 | 90.4 | 1.3 |

*Zinc oxide and eugenol paste of moderate consistency is mixed and placed gently to fill the entire cavity; also checked to clear occlusion. At a subsequent visit, most of the zinc oxide and eugenol is removed, enough being left as a base to cover the area of exposure. The permanent filling is then placed.

†Silver nitrate cement liquid (special liquid) is made by adding silver nitrate to regular cement liquid and mixing to insure saturation. The solution is then filtered. The filtrate is mixed with cement powder as needed. The cement is mixed to a thin consistency. A small amount is placed gently over the exposure area and teased onto the adjacent tooth structure to form a cement base. This is allowed to set with no further manipulation. The permanent filling is placed immediately after the cement has set.

### AGE FACTOR

Table 4 shows the distribution of the successful and unsuccessful cases according to the approximate age of the patient at the time of pulp capping. The year from 4 to 5 years has the lowest percentage of success. The later age groups have decidedly higher percentages. At present, the conditions responsible for these

differences can only be conjectured. Table 5 shows the distribution of the successful cases according to (1) age at time of capping and (2) pulp capping material in the five larger groups. The mean ages for these groups show no appreciable differences. The mean age of the combined groups is about 6½ years.

### HISTOLOGIC CORROBORATION

Fifteen teeth from this clinical investigation in which the pulps were capped with red copper cement powder and silver nitrate cement liquid were studied histologically and reported previously by L. R. Stowe, of the Division of Dentistry for Children.[14] These cases were classified as successful and the teeth were in normal function from two to six years. They were extracted some months before the time of exfoliation for study purposes. Dr. Stowe found that the pulps generally remained normal, some presenting evidence of localized inflammatory changes. Areas of secondary dentin, some of massive proportions, were frequently noted.[16] While Dr. Stowe's studies represent the earliest report of the finding of secondary dentin in deciduous teeth after pulp capping, there are several references in the literature to the formation of secondary dentin in deciduous teeth under both normal and experimental conditions. As early as 1873, an incompletely resorbed deciduous cuspid was reported by Cutler with secondary dentin appearing perfectly united with primary dentin and completely filling the pulp cavity.[17] In 1875, Salter referred to secondary dentin as dentin of repair and stated that it sometimes occurs in deciduous teeth.[18] More recently, Kronfeld has shown secondary dentin in a deciduous tooth with pulpal disease,[19] and Fish,[20] Teuscher and Zander,[21] and Restarski[22] have promoted the formation of secondary dentin in human deciduous teeth *in vivo*.

This mass of evidence on secondary dentin formation in deciduous teeth

TABLE 2.—PERIOD OF SERVICEABLE RETENTION OF DECIDUOUS TEETH AFTER PULP CAPPING (SUCCESSFUL CASES)

| Time Years | Zinc Oxide and Eugenol | Zinc Oxide and Thymol | Copper Cement and Special Liquid | Zinc Cement and Special Liquid | Copper Cement and Regular Liquid | Other Agents* | Total |
|---|---|---|---|---|---|---|---|
| ½ | 6 | 1 | 39 | 4 | 28 | 1 | 79 |
| 1 | 8 | 5 | 27 | 7 | 13 | 2 | 62 |
| 1½ | 16 | 4 | 42 | 6 | 36 | 6 | 110 |
| 2 | 7 | 2 | 27 | 7 | 7 | 3 | 53 |
| 2½ | 11 | 4 | 26 | 6 | 20 | 1 | 68 |
| 3 | 4 | — | 14 | 3 | 1 | 1 | 23 |
| 3½ | 5 | 2 | 12 | 9 | 1 | — | 29 |
| 4 | 2 | — | — | 2 | — | — | 4 |
| 4½ | 4 | 4 | 6 | 1 | — | — | 15 |
| 5 | 1 | 1 | 3 | 3 | — | — | 8 |
| 5½ | 3 | — | 5 | — | — | — | 8 |
| 6 | — | — | 1 | — | — | — | 1 |
| 6½ | 1 | — | — | 1 | — | — | 2 |
| 7 | — | 1 | — | — | — | — | 1 |
| Total | 68 | 24 | 202 | 49 | 106 | 14 | 463 |
| Means†: | 25.6±2.0 | 27.6±3.7 | 20.0±1.2 | 26.8±2.3 | 14.5±.85 | | |

*Other agents include the small group capped with silver cement and special liquid.

†Mean periods of serviceable retention given in months (with standard error). The mean for the five larger groups combined is 20.8±0.74.

eliminates a frequently cited contraindication to pulp capping, and presents a biologic indication in its favor.

No evidence has been found that the pulp of the deciduous tooth plays any part in the resorption of its root. In fact, no histologic evidence was found that the pulp of the deciduous tooth is different from the pulp of the permanent tooth.

that pulp capping in deciduous teeth can be done successfully in about 90 per cent of cases in which it is attempted if the procedure described in this report is followed carefully; too, that success is not so dependent on the choice of a pulp capping agent as it may be on one or more factors in the procedure common to all groups. These contentions are borne out by statistical analysis of the findings. (The data in this report were extensively analyzed statistically by Bion R. East, assistant professor of public

TABLE 3.—PERIOD OF SERVICEABLE RETENTION OF DECIDUOUS TEETH AFTER PULP CAPPING (UNSUCCESSFUL CASES)

| Time Years | Zinc Oxide and Eugenol | Zinc Oxide and Thymol | Copper Cement and Special Liquid | Zinc Cement and Special Liquid | Copper Cement and Regular Liquid | Other Agents* | Totals |
|---|---|---|---|---|---|---|---|
| ½ | 7 | 1 | 5 | 1 | 4 | 1 | 19 |
| 1 | 4 | 2 | 8 | — | 4 | — | 18 |
| 1½ | — | — | 2 | 3 | 1 | — | 6 |
| 2 | — | — | — | — | — | — | — |
| 2½ | 1 | 1 | 3 | — | — | — | 5 |
| 3 | — | — | — | — | — | — | — |
| 3½ | — | — | — | — | — | — | — |
| 4 | — | — | 1 | — | — | — | 1 |
| Total | 12 | 4 | 19 | 4 | 9 | 1 | 49 |
| Means*: | 8.0±2.2 | 13.0±5.0 | 13.0±2.7 | 10.5±3.2 | 6.9±1.5 | | |

*Mean periods of serviceable retention given in months (with standard error). The mean for the five larger groups combined is 10.5±1.4.

TABLE 4.—AGE FACTOR IN RELATION TO SUCCESSFUL CASES OF DECIDUOUS PULP CAPPING

| Approximate Age Date of Capping Years | Successful Cases | Unsuccessful Cases | Successful : Unsuccessful Ratio (Year Groups) | Approximate Success (Year Groups) Per Cent |
|---|---|---|---|---|
| 3½ | 4 | 1 | 22:4 | 85 |
| 4 | 18 | 3 | | |
| 4½ | 13 | — | 55:17 | 76 |
| 5 | 42 | 17 | | |
| 5½ | 22 | 3 | 122:14 | 90 |
| 6 | 100 | 11 | | |
| 6½ | 28 | 1 | 129:7 | 95 |
| 7 | 101 | 6 | | |
| 7½ | 15 | — | 89:4 | 96 |
| 8 | 74 | 4 | | |
| 8½ | 9 | 2 | 32:2 | 94 |
| 9 | 23 | — | | |
| 9½ | 3 | — | 6:— | 100 |
| 10 | 3 | — | | |

## COMMENT AND CONCLUSIONS

In view of these findings, the results of a decade of observation, we may say

health practice, Columbia University, New York, and the results were found to be significant.)

One of these factors may be the technic of the operative procedures and the exercise of care. It should be remembered that while many of these cases were treated by a number of students, care was always stressed in instructions given to them.

A second factor is the protection to the pulp and prevention of further trauma by a base of any one of the agents discussed, and the placing of a permanent filling as soon as possible. At no time did we require a probationary period of observation between pulp capping and placing the permanent filling. It was thought to be advisable to cover the area of exposure and place the filling immediately as the most practical method of restoring the tooth to function with a minimum of pressure on the pulp.

A third factor common to all the cases is the use of phenol. The opinion has been expressed by some authorities that phenol is too irritating for application near the pulp and should not be used.[23] Others have favored the application in some pulp exposures, but advised following it with alcohol.[8] In this study, phenol was in all cases applied directly to the exposure area and surrounding area, and was not followed by alcohol.

The selection of cases is another common factor. Although the study includes both carious and surgical pulp exposure cases, our clinical requirements of (1) sensitivity to touch and (2) evidence of hemorrhage at the point of exposure are universal. Proper diagnosis is necessary to determine the condition present and the treatment indicated. We realize that clinical diagnosis alone cannot determine the exact condition of the pulp. With these two criteria, plus removal of all decay in the cases of carious exposure, the operator can ascertain whether he is treating an exposure of a vital pulp with adjacent sound tooth structure in an otherwise normal tooth. A number may have been borderline cases, or slightly beyond the borderline. In these cases, it was not possible to see a beginning tendency to pulp degeneration. This may be one of the conditions partly re-

TABLE 5.—MEAN AGES OF SUCCESSFUL CASES OF PULP CAPPING IN THE FIVE LARGER GROUPS

| Approximate Age at Date of Capping Years | Zinc Oxide and Eugenol | Zinc Oxide and Thymol | Copper Cement and Special Liquid | Zinc Cement and Special Liquid | Copper Cement and Regular Liquid | Total |
|---|---|---|---|---|---|---|
| 3½ | 1 | — | 2 | — | 1 | 4 |
| 4 | 5 | 1 | 6 | 2 | 2 | 16 |
| 4½ | 3 | — | 8 | — | 1 | 12 |
| 5 | 5 | 2 | 18 | 6 | 10 | 41 |
| 5½ | 1 | — | 14 | 2 | 3 | 20 |
| 6 | 15 | 5 | 45 | 12 | 23 | 100 |
| 6½ | 3 | 1 | 15 | 1 | 7 | 27 |
| 7 | 13 | 4 | 40 | 12 | 29 | 98 |
| 7½ | 2 | 2 | 5 | 4 | 3 | 16 |
| 8 | 12 | 2 | 34 | 5 | 18 | 71 |
| 8½ | 2 | 1 | 3 | 2 | 1 | 9 |
| 9 | 2 | 2 | 9 | 1 | 8 | 22 |
| 9½ | — | — | 1 | 2 | — | 3 |
| 10 | — | 1 | 2 | — | — | 3 |
| Total | 64 | 21 | 202 | 49 | 106 | 442 |
| Mean ages at time of capping | 6.3±.17 | 6.8±.31 | 6.4±.10 | 6.5±.18 | 6.6±.12 | 6.5±.06 |

sponsible for our 9.6 per cent of unsuccessful cases.

The findings also indicate that deciduous pulp-capped teeth can be retained as normal, vital, functioning members for appreciable lengths of time. Many of them were exfoliated normally after several years of service. These results are very important in relation to deciduous teeth. They represent increasing clinical evidence of the ability of the deciduous tooth pulp to remain vital and functioning, overcoming injury from deep caries and pulp exposure; also that root resorption and exfoliation proceed normally in these cases.

Pulp capping in deciduous teeth can be done with a large measure of success at any age. However, there appears to be a greater degree of success among the cases capped at higher ages.

An uncomplicated and efficient method for treating these pulp exposed deciduous teeth, hitherto treated by more radical procedures or condemned to extraction, would tend to reduce greatly the number of prematurely extracted teeth and the resulting loss of masticating surface and space maintenance. It would also tend to diminish other harmful effects of premature extraction, such as impaired mastication, drifting of adjacent teeth and the necessity for artificial space retainers, especially among children unable to afford preventive orthodontic service.

Pulp capping, a practical and highly successful procedure, can be applied as easily in private dental offices as it is in a children's dental clinic. By this method, many of these cases can be disposed of in the course of a single office visit.

In a community where a great number of such cases require treatment, the necessary operative time and cost would be reduced, as would the loss of school time because of pain and other sequelae of lack of treatment or too extensive treatment.

The results reported indicate the importance of pulp capping to dentists, as practitioners and health officers, interested in the betterment of children's dental welfare.

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# FOCAL INFECTION ASSOCIATED WITH PULP STONE: REPORT OF A CASE

By L. E. THOMPSON, M.D., Salida, Colo.

*History.*—A woman, aged 36, married, first seen in May 1936, complained of redness of the left eye with blurring of vision and some pain in the eye. The personal history was negative except for the fact that a large number of large red sore spots had appeared all over both legs in the past several months and frequent attacks of severe neuritis in the shoulders had been experienced for several years. The family history was essentially negative.

*Examination.*—Examination revealed a severe type of plastic iritis. Complete physical and laboratory examination revealed nothing except a low hemoglobin (60-70), a low red count and a high white count (12,000 to 15,000); rather extensive healed childhood tuberculous lesions in the lungs, several teeth containing fillings of various sizes, and large numbers of Heberden's nodes and of rheumatic nodules on both legs. Three of the teeth looked grossly pathologic.

*Treatment.*—Dental consultation was obtained and the report was negative. Under rigid eye treatment, the iritis cleared up in three or four weeks, the patient gained weight and the blood picture returned virtually to normal. The rheumatic nodules and the neuritic attacks persisted.

*Course.*—The following May, this history was duplicated exactly, but this time in the right eye. During the winter of 1937, the patient was in California for two months and returned weighing more than ever before in her life and with the blood picture normal. While in California, she had seen a dentist who told her that her teeth were normal, and at another time a dentist had reported them normal.

In June 1938, another attack of iritis developed, but this time in both eyes and so fulminating that vision rapidly decreased to light only. About this time, tinnitus developed in the right ear. Another dentist was seen and the dental report was still negative. The patient refused to have any teeth extracted on the chance that removal of this potential source of infection might help.

Another eye specialist made a diagnosis of tuberculous iritis, but suggested x-ray examination by a man who did nothing but make dental x-ray diagnoses. I almost convinced the diagnostician that at least two teeth should be removed, but, after studying the plates carefully, he decided that the teeth were normal.

In the meantime, the patient rapidly lost about 10 pounds and the blood count changed to about 60 per cent hemoglobin, with red cells around 3,000,000 and white cells about 15,000. She still refused to have teeth removed on the chance that she might be helped. The eye treatment was continued for some time, with no improvement. The tinnitus continued with no change except slight temporary improvement after tubal inflation, and in July, the patient had an attack of vertigo, ataxia, nausea and vomiting so severe that she was forced to stay in bed twenty-four hours.

*Operation.*—Two other eye specialists consulted suggested that the teeth were the most likely cause of the trouble, and one of them referred the patient to a dentist who was also a physician. After x-ray and other examinations, he decided that at least two teeth should be removed, and to this the patient finally consented. Within a week,

her eyes improved and, after lengthy treatment, they returned practically to normal. The rheumatic nodules almost completely disappeared, as did the neuritis, except for infrequent slight attacks in the left shoulder. The tinnitus also continued, but was not so severe. Pathologic examination and culture of the extracted teeth showed a strong growth of short chain streptococcus from the inside of the teeth (pulp stones).

*Outcome.*—The patient remained almost entirely well for two and one-half years except for occasional slight neuritic attacks, an occasional red nodule on the legs, slight tinnitus and one rather severe attack of vertigo, ataxia, nausea and vomiting in January 1939.

In August 1940, she again developed an iritis in the right eye, but this time of a much milder type. The remaining teeth with pulp stones were promptly removed and cultured and showed short chain streptococcus. Within a short time, the eye cleared up and the tinnitus completely disappeared. The few remaining Heberden's nodes disappeared. When seen recently, she had had no more neuritis and had gained 13 pounds. In every way, she is in better health than she has been in over six years.

## CONCLUSIONS

1. While its most serious aspects were ophthalmologic, this case also had otologic factors which were serious.

2. The x-ray evidence cannot be too greatly depended on.

3. Medical men must frequently advise extraction of teeth regardless of, and often in spite of, dental advice.

4. Wholesale removal of teeth is not to be advocated as a cure-all of disease elsewhere in the body, but, after complete examination of the patient and in the absence of other causative factors, abnormal teeth should be removed.

5. Whether abnormal teeth act as foci or whether their removal merely has a reaction in the nature of a foreign protein reaction, there is definite proof that their removal does frequently result in the cure of disease elsewhere in the body, and often of the eyes, ears, nose and throat. Under the term "abnormal," I include those which contain pulp stones, even though they be otherwise normal.

6. Six dentists examined the teeth of this patient and pronounced them normal.

Since becoming interested in teeth and their pathologic possibilities as a result of this case, I have seen a case of optic neuritis which cleared up after removal of a tooth with a pulp stone; tic douloureux which was cured in the same manner, and severe sharp shooting pains in the ear and a laryngitis that were cured by the removal of diseased teeth.

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# CONTINUOUS CLINICAL AND BACTERIOLOGIC STUDY OF PROXIMAL SURFACES OF PREMOLAR TEETH BEFORE AND AFTER THE ONSET OF CARIES

By J. R. Blayney, D.D.S., M.S.; S. F. Bradel, D.D.S.; R. W. Harrison, Ph.D., and Elizabeth S. Hemmens, Ph.D., Chicago, Ill.

IT has been well established that lactobacilli are associated with dental caries. For example, in 1940, we reported that, in 477 patients with clinical evidence of caries, lactobacilli were found in 77.6 per cent of 3,920 specimens. On the other hand, in fifty-six patients who were caries free, this micro-organism was found in only 25 per cent of 333 specimens. Other laboratories have reported similar findings. These specimens were obtained by having the patient chew a piece of paraffin and collecting the saliva. On the basis of such data, some investigators have attributed to the lactobacillus the specific etiologic rôle in dental caries. We believe that evidence of this kind is insufficient to warrant this conclusion.

It should be emphasized that the samples collected in the manner indicated represent the micro-organisms that are dislodged by the paraffin from the tooth surfaces and mucous membranes. It is obvious that, with this method of sampling, it is impossible to determine the specific areas from which the organisms were recovered. Furthermore, it has been demonstrated that bacterial plaques are present on non-carious areas as well as over areas of initial caries. Proof that a specific micro-organism is responsible for the initiation of caries must be based on data showing the presence of the organism at the specific site where the lesion develops, with sufficient frequency to be statistically significant, and over a period of time long enough for the lesion to become demonstrable.

For the past five years, we have conducted a continuous study to determine whether a characteristic bacterial flora is associated with the initiation of dental caries. Reports of our findings have been published from time to time in various journals. This report covers one phase of the investigation, which has consisted of removing and culturing the bacterial plaques from proximal surfaces of premolar teeth, from the time the tooth erupts into occlusion and makes contact with the proximating tooth until a readily demonstrable lesion develops.

## METHOD

From two to four suitable areas were selected for study in each of sixty patients, ranging in age from 10 to 12 years. Either the distal surface of the first premolar or the mesial surface of the second premolar, in two or more quadrants, was usually chosen. In a few cases, the distal surface of the second premolar was utilized, even though the increased difficulty in making clinical examinations of this area was recognized.

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In only a few cases were two proximating surfaces studied.

The patients were recalled at six-week intervals. A mechanical separator was applied and the area selected was thoroughly washed with a stream of water, isolated with cotton rolls and thoroughly dried. Saliva was not permitted to come in contact with the tooth surface after it had been washed. With a specially constructed extra-fine sterile Bates scaler, the bacterial plaque from the area just gingivally to the contact point was removed. The material was transferred to a small vial containing from 2 to 3 drops of sterile veal infusion broth. During the procedure, care was taken to avoid contact of the instrument with any other tooth surface or with saliva. With the separator still in place, a careful clinical examination with suitable explorers was made and recorded. At three-month intervals, a bitewing roentgenographic examination of the area under observation was made.

TABLE 1.—COMPARISON OF CLINICAL AND ROENTGENOLOGIC METHODS OF DETECTING PROXIMAL SURFACE CARIES

| Method Showing Earliest Indication of Caries | Cases No. | Per Cent |
|---|---|---|
| Roentgenologic | 36 | 64 |
| Roentgenologic-clinical (simultaneous) | 13 | 23 |
| Clinical | 7 | 13 |
| Total | 56 | 100 |

TABLE 2.—INCIDENCE OF LACTOBACILLUS CULTURED FROM PLAQUES

| Clinical Condition | No. Areas | No. Specimens | + Lactobacillus No. | + Lactobacillus Per Cent |
|---|---|---|---|---|
| − | 39 | 284 | 83 | 29 |
| − to + | 56 (area−) | 316 | 76 | 24 |
| | (area+) | 241 | 128 | 53 |
| + | 25 | 132 | 56 | 42 |
| | 120 | 973 | | |

In the laboratory, the plaques were prepared for culture by trituration in the tube, in which they were collected, with a sterile glass rod. A small amount of the suspension was used to inoculate a blood-agar plate. The remainder of the sample was diluted to 1 cc. with Jay's broth and thoroughly mixed, and 0.4 cc. was used to inoculate a Kulp's acid-tomato-agar plate. The remainder was incubated as a Jay's broth culture. All cultures were incubated anaerobically, since previous studies had shown that none of the micro-organisms were obligately aerobic, and all forms which grew aerobically also developed on anaerobic plates. The cultures were incubated for from three to four days; the plates were examined with the aid of a low-power binocular microscope, and representative colonies were selected for study. Cultures were examined for colony and cell structure, staining properties, hemolytic activity, acid production and acid tolerance.

TABLE 3.—INCIDENCE OF LACTOBACILLUS BEFORE AND AFTER DEMONSTRATION OF CARIES

| Months | Samples + Lactobacillus Per Cent | |
|---|---|---|
| 10½ | 7 | |
| 9 | 27 | |
| 7½ | 24 | |
| 6 | 20 | Area− |
| 4½ | 38 | |
| 3 | 34 | |
| 1½ | 36 | |
| | 43 | |
| 1½ | 57 | |
| 3 | 43 | |
| 4½ | 53 | Area+ |
| 6 | 63 | |
| 7½ | 67 | |
| 9 | 77 | |

Plaques from the areas selected were removed and cultured until the carious lesions could be readily demonstrated, by which time the lesion usually had pene-

trated to the dentino-enamel junction. A large number of areas are still under observation.

## RESULTS

The results presented here will be limited to the incidence of lactobacillus in the plaques cultured. Our findings concerning the other bacterial forms recovered will be presented in another report.

Our data have been analyzed from the standpoint of correlating the laboratory findings with our clinical observations. It would appear that this should be relatively easy to do, but whereas the laboratory findings are entirely objective, that is lactobacilli are either present or absent in the cultures, the clinical data are dependent to a certain extent on the judgment of the examiner. The transition from a perfectly intact surface to the point of definite cavitation is a gradual one, requiring several months. At certain stages, one cannot state with certainty whether the integrity of the surface has been destroyed on the basis of clinical or roentgenographic examinations. During the very early stages in the development of the lesion, it was occasionally found necessary to use the notation questionable negative or questionable positive. In some cases, two or more consecutive examinations of an area would be recorded as questionable, to be followed by repeated positive findings.

In reviewing our data concerning the roentgenographic examinations, we found that when single films of an area were studied, we not infrequently recorded the findings as questionable negative or questionable positive. However, with a whole series of films of each area arranged in chronologic order, we were able to detect changes with greater accuracy, and, as a rule, at an earlier stage of the caries process.

Table 1 shows a comparison of clinical (separator and explorer) methods with roentgenographic (bite-wing film) methods in detecting the earliest indications of proximal surface caries. In thirty-six, or 64 per cent, of fifty-six surfaces that developed caries, there was roentgenographic evidence of caries prior to the clinical examination. In 13, or 23 per cent, of the cases, simultaneous positive findings were recorded by the two methods. In seven, or 13 per cent, of the cases, caries was first detected by clinical methods. As the lesion advanced, results of both examinations were repeatedly positive in all cases. An area was considered as carious when positive findings were noted by either clinical or roentgenographic examination.

Table 2 represents a summary of the incidence of the lactobacillus cultured from 973 bacterial plaques removed from 120 areas. It will be noted that the areas have been divided into three groups: (1) those areas which have been clinically and roentgenographically negative throughout the study; (2) those areas which were originally negative and subsequently developed caries, and (3) a group of areas which were positive clinically at the beginning of the study. All areas in Group 1 are still under observation. Data on sixty-four additional areas have been omitted from the summary because sufficient plaques have not been obtained. The percentage of specimens from which lactobacilli were cultured is indicated in the right hand column.

It should be kept in mind that the carious process begins some time before it is possible to demonstrate the lesion by clinical methods, either with the explorer or in the roentgenogram. To determine the incidence of the lactobacillus in bacterial plaques removed just prior to demonstration of the lesion, the data recorded for the second group of areas in Table 2 (those which developed caries during the study) were arranged in chronologic order and in such manner that the date of demonstration of caries for all the areas coincided. By this means,

it was possible to analyze our results with respect to time relationships. Table 3 represents the data so arranged. The number between the two lines represents the percentage of samples positive for lactobacilli on the day that caries was first demonstrated. The values above the line represent the incidence of the lactobacillus in plaques removed at the various time intervals prior to the demonstration of caries. Similarly, the values below the line indicate the incidence of the lactobacillus after the demonstration of caries. The numbers of specimens in each group, although not identical, are comparable. It will be noted that there is a definite increase in incidence of the lactobacillus as the lesion develops and increases in size. However, attention should be called to the fact that the values shown represent percentages of the total specimens in each group. When each area was considered individually, the bacteriologic findings were very irregular; that is, positive and negative cultures were distributed at random. In a few cases, the cultures were repeatedly negative even though an active lesion was known to be present.

At each time that a patient was recalled and just prior to the removal of the plaques, a "salivary specimen" was collected and cultured for lactobacilli. Of 524 samples studied, 345, or 66 per cent, were positive for the lactobacillus. We found, however, that in fifty-eight, or 32 per cent, of the cases in which salivary cultures were negative, lactobacilli were cultured from one or more plaques taken at the same time. These results indicate that chewing paraffin is not an effective method for recovering the micro-organisms present on the portion of the proximal surface where caries is initiated.

## SUMMARY

The results of a study of bacterial plaques found on proximal surfaces of premolar teeth have been presented and correlated with the clinical condition of the enamel surface from which they were removed. A definite increase in incidence of the lactobacillus as a carious lesion develops and progresses has been demonstrated, but no conclusions concerning the exact relationship of the lactobacillus to dental caries can be drawn. There is need for further investigation to clarify this point.

The data accumulated by means of repeated clinical examination, made under ideal conditions, together with the study of a large series of roentgenographic films, served to emphasize the difficulty of evaluating caries activity. Initial proximal surface caries cannot be accurately diagnosed without the aid of satisfactory bitewing films examined under a magnifying glass. The regular apical dental films are not satisfactory substitutes. Careful examination of serial bitewing roentgenograms will reveal lesions months before they can be detected by the methods usually employed.

We wish to emphasize also that single examinations are of little value in determining the degree of caries activity. Areas which appear to be caries free may be in a subclinical stage, and failure to take this factor into consideration may lead to misinterpretation of data. The clinical aspect of the caries problem constitutes a definite stumbling block in the determination of the etiologic factors of this disease and presents a challenge to the keenest powers of observation of the investigator and clinician.

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# EXPERIMENTAL STUDIES ON CARIES

## I. A TECHNIC FOR CLEARING TEETH

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SINCE the initial work of Shibata[1] in 1929, the most extensive studies on rat caries have been those of Rosebury and his co-workers.[2, 3, 4, 5] These workers fed rats a diet of coarse rice or corn to produce carious lesions of several types, of which one was considered analogous to human caries. The extent of this type of caries was determined under the microscope by the use of standard histologic methods of handling ground or decalcified sections. These procedures are time consuming and laborious, requiring considerable technical skill, and even then do not insure obtaining the deepest portion of the lesion. Moreover, the tooth must necessarily be destroyed except for the thin section which remains. Owing to the difficulty and wastefulness of these methods, why Rosebury prepared sections of only three of the twelve molars in each animal to determine the incidence of caries in rats is understandable.

It is doubtful whether this method can give a complete picture of either a single carious lesion or the incidence of caries in any given species, particularly if there is more than a single cavity in a given tooth. Therefore, it was thought desirable to find a convenient and satisfactory technic which would permit a more complete study of the carious lesions in experimental animals.

### METHOD

A search was made for a clearing agent which would render the teeth sufficiently transparent for microscopic study without destroying any tooth substance or modifying the distinction between sound and carious material. In the ideal solution, in addition to the foregoing, the distinction between these areas would be emphasized by the production of a marked color differentiation. A number of solutions were studied. The silver nitrate staining technic of Gomori[6] proved unsatisfactory in our hands. Xylene, glycerol and mineral oil were shown to have no clearing action. Methyl salicylate, a clearing agent sometimes used in histologic studies of bone, cleared the mandible quickly and easily without apparent alteration of the opacity of the teeth. The use of aniline oil, although it clears both bone and teeth rapidly, does not permit a clear color distinction between carious material and pulp. The closest approach to the ideal was found to be *phenol liquefactum,* U.S.P. (88 per cent phenol in water). This solution cleared maxillae, mandibles and teeth of rats on immersion for thirty-six hours at room temperature. Figure 1 shows a rat mandible that had been treated with liquefied phenol in this manner as compared with an untreated mandible. Neither the amount of oxidation as shown by color nor the volume of the phenol solution has any apparent effect on the rate or intensity of the clearing reaction. Attempts to reduce the inconvenience of handling an irritant such as phenol by dilution with alcohol, glycerol or camphor were unsuccessful, since the clearing property was lost. All observations of these teeth must be made as wet

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mounts while they are immersed in liquefied phenol, since their natural opacity returns after about ten minutes in room air. Any attempt to dissolve the phenol out, as, for instance, by the use of alcohol, has the same result.

Upon examination of the tooth with a hand lens or under the dissecting microscope, the enamel appears clear, smooth and glistening, with any lamellae or other faults appearing upon higher magnification (×100-400) as gray lines or areas. The dentin appears as a gray mass clearly separated from the enamel by a light gray line, which is the dentinoenamel junction. The direction of the dentinal tubules can be distinguished with low magnification (×10-40); while, with higher magnification, individual tubules are visible as gray lines. The pulp tissue appears as a yellow mass containing granules which may or may not be cell nuclei. The pulp retains its original size, showing that this treatment does not lead to shrinkage.

Carious lesions are easily differentiated since the carious material is yellowish brown and usually clearly demarcated from the rest of the tooth. An example of experimental rat caries is seen in the photomicrograph in Figure 2.

## DISCUSSION

That the clearing process is not a decalcification is shown by the following experimental results: 1. Tribasic calcium phosphate is not soluble in liquefied phenol. 2. The phenol in which the tooth has been cleared contains no inorganic material upon ignition. 3. The original opacity returns upon removal from the phenol. Neither is it a destruction of the protein matrix, as is shown by the further experimental evidence that: 1. Decalcification of a cleared tooth leaves an apparently normal protein matrix. 2. The solution of the protein matrix from a previously decalcified tooth does not occur within the period of time required for the clearing of similar teeth. It thus appears that no chemical change takes place.

It seems probable that the clearing action of the liquefied phenol is due to a reduction in number of the refracting surfaces within the tooth by its diffusion inward into the interstices of the tooth structure. The best evidence supporting this view lies in the consideration of the refractive indices. According to Manly and Hodge,[7] the refractive index of dentin is 1.56 and of enamel, 1.60. Pure phenol at 21° has an index of refraction of 1.5509, and aniline has an index of refraction of 1.5863. While the index of refraction of liquefied phenol is somewhat lower than that of pure phenol, the difference is not significant for our purposes. Theoretically, if the indices of refraction of object and agent approach one another closely, and if the agent penetrates the object, clearing should take place. The failure of methyl salicylate, refractive index 1.5377, to clear teeth must be due, therefore, to its slow or otherwise inadequate penetration of the tooth structure. The relatively rapid penetration of dentin and cementum by phenol has recently been observed by Thomas[8] in a study of tooth permeability. The importance of the penetration factor is shown further by the fact that the rate of clearing is increased with an increase in temperature so that, in a boiling water bath, clearing of a rat mandible and teeth is complete within about five hours. The fact that the mandible itself is cleared much more quickly than the denser material of the tooth also supports this view.

Although these studies are primarily concerned with caries produced in rat teeth, it has been observed that extracted human teeth also may be cleared by this technic. As might be expected from the size and density of human teeth, the time required for clearing is correspondingly increased. Clearing of human teeth with aniline appears to proceed more rapidly than clearing with phenol.

This technic can be employed for many purposes. The method can be used for the three-dimensional study of pulp chamber and root canal structure in human teeth, either extracted or in the jaws of cadavers. To illustrate the range of normal anatomic variation, for pedagogic purposes, the preparation of permanent specimens for pulp chamber anatomy study can be conveniently accomplished at the cost of about one test tube and a few cubic centimeters of clearing agent per specimen. Both liquefied phenol and aniline can be used for this purpose, since both are adequate clearing agents and are about equally stable in the absence of air. However, because of its greater rate of clearing, aniline is the agent of choice for this purpose. This method is also suitable for studies on the possibility of stimulating the growth of secondary dentin. Such studies are now under way in this laboratory.

This method will probably find its widest application, however, in the study of caries. Its ease and quickness give it a decided advantage over the older methods by permitting a study of all the teeth of a large number of animals in a short time. By focussing up and down on the microscope and by making use of the narrowness of the focal plane at high magnifications, a three-dimensional study of the tooth is possible, so that the point of furthest penetration of any given carious lesion can be detected. The completeness of study which this method allows is its outstanding virtue. In addition, after histologic examination is completed, all the tooth and bone remain for further observations by chemical or other methods. As previously mentioned, liquefied phenol should be used in these studies since it emphasizes the color distinction between carious and sound material.

Although there seem to be no major disadvantages to this method, care must be taken to avoid possible errors in observation which may arise from the color of pulp or food material above or below the focal plane which may impart a yellow tint to the enamel or dentin. With a little experience, confusion due to this condition may be avoided.

## SUMMARY

1. Teeth may be made sufficiently transparent for microscopic examination by immersion in *phenol liquefactum*, U.S.P., or aniline for a few hours or days, the time depending on the size and density of the specimen. The clearing process is accelerated by heating in a water bath.

2. The clearing process is probably a physical effect which accompanies the inward diffusion of the phenol or aniline.

3. The method has advantages over the older methods for histologic examination of teeth because it is simple, and because destruction of the tooth is not necessary and all parts of it remain visible for study and comparison.

4. Teeth cleared by this method may be used for study of pulp chamber and root canal structure, factors in the growth of secondary dentin and factors in the production, susceptibility and incidence of caries, etc.

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# VITAMIN C THERAPY IN PERIODONTAL DISEASE

By Dorothea F. Radusch, D.D.S., B.A., M.S., Minneapolis, Minn.

In the year 1720, Kramer (Harris, 1938) wrote that 3 or 4 ounces of orange or lime juice would cure the dreadful disease scurvy without other help; but the fact was not universally accepted and, in the intervening period, scurvy was ascribed to many different conditions. Today, there is evidence that 3 to 4 ounces of orange juice will maintain a blood ascorbic acid level in normal patients which is within the range of adequate vitamin C nutrition.

Modern nutritionists called the beneficial substance so long known to be present in citrus fruits vitamin C. This was later identified as a chemical compound of known structure, ascorbic acid, and it is now manufactured for use in laboratory and clinical work. Scientists have stated that, in the absence of sufficient ascorbic acid, various cells of mesenchymal origin are unable to form normal intercellular substance. There is also failure of connective tissue cells to form collagen fibers.

As Hambidge (1939) describes it:

Certain cells in the bones and teeth and elsewhere are surrounded by a firm jelly-like or cement-like substance. When the body is deprived of vitamin C, this substance becomes thin and watery, and is no longer effective in holding the cells in place. . . . Vitamin C is also an oxidizing-reducing agent; that is, it readily combines with either oxygen or hydrogen, and this may be important in its body functions, perhaps accounting for the fact that it is necessary for the proper functioning of a substance in the blood (the blood serum complement) that acts as a primary defense against infections. After ascorbic acid has taken on a load of oxygen, it is no longer active. This means that it can easily be destroyed or damaged by exposure to air.

Some animals—among them poultry, swine, and cattle—manufacture their own vitamin C. Others, including man, monkeys, and guinea pigs, must get it in their food. When they do not, several things happen. Diseases that would otherwise be resisted become dangerous; the walls of small blood vessels are weakened and break easily, producing small hemorrhages, called petechiae, under the skin; joints stiffen and feel sore; gums swell and bleed, and teeth loosen; wounds heal with difficulty, even when they are not infected.

These are symptoms of a severe shortage of vitamin C. A milder deficency may affect health without any very obvious outward signs.

## VITAMIN C: RESEARCH AS APPLIED TO PERIODONTAL CONDITION

The early scientific knowledge of the effects of lack of vitamin C was based on experimentation on guinea-pigs, which appear to be unusually susceptible to the deficiency. Howe (1922) described looseness and elongation of teeth, alveolar process disintegration and various tissue changes in guinea-pigs on a scorbutic diet. All these conditions were improved by adding orange juice. Because of the experimental procedure followed, and since orange juice supplies many substances besides vitamin C, this work can be considered only as suggestive. More recently, Boyle, Bessey and Wolbach (1937, 1938) maintained guinea-pigs for long periods on a basal vitamin-

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C-free diet, supplemented by small suboptimal doses of ascorbic acid. These animals showed gross x-ray and microscopic changes from normal, which the authors reported as identical with those characteristic of the systemic type of human pyorrhea. They state that the systemic type occurs in well-cared-for mouths, and pocket formation is not an essential part of the process, but usually a late complication; also, that vitamin C deficiency is the only nutritional deficiency which, in their experience, produces the characteristic features of the systemic type of pyorrhea in experimental animals. They do not report the experiments upon which this broad conclusion is based. It might be well to point out that pockets are found in the majority of cases seen in daily practice.

Westin (1938) says:

> In my study of latent scurvy in man, I have shown, as regards gingivitis, that this condition may well be due to C hypovitaminosis, but that it is by no means a predominant or specific factor in the pathologic picture. With regard to marginal alveolar osteitis, while I have accounted for the pronounced alveolar dystrophia of latent scurvy . . . I have not been able to form any definite opinion as to how far scorbutic alveolar dystrophia has any pathogenetic effect on the frequency of alveolar pyorrhea under modern conditions of life.

Divergent opinions as to the rôle of vitamin C arise in part because reports of studies on blood plasma ascorbic acid concentrations as related to the incidence of bleeding gums or gingivitis indicate little or no correlation between the two factors (Herlitz, 1938; Croft and Snorf, 1939; Breuer and Kaldarar, 1939; Freeman and Glass, 1938).

TABLE 1.—VITAMIN C VALUES OF TOMATO JUICE, STRAWBERRIES AND CANTALOUPES

| | Quantity | Bryan and Turner (1940) | Bessey (1939) | Daniel and Munsell (1937, 1941) |
|---|---|---|---|---|
| Tomato juice | ¾ c | 11 to 28 mg. | 25 to 30 mg. | 18 to 30 mg. |
| Strawberries | ¾ c. | 25 to 52 mg. | 50 mg. | |
| Cantaloupe | ⅓ of 4½ inch melon | | 40 mg. | 33 mg. |

Thus, it would seem that Boyle's conclusions could, in any case, apply to only a small number of the periodontia cases that the dentist is called upon to treat.

No significant correlation was found between estimated intake of vitamin C and periodontal condition by a dietary survey of 135 dental patients (Radusch, 1939). One hundred seven took orange or grapefruit almost daily, yet gingivitis and periodontal involvement was present in most instances. However, a diet completely lacking in vitamin C produces extensive gingivitis in guinea-pigs, monkeys and man. There is lack of agreement as to how much vitamin C is necessary to prevent gingival abnormalities and how many of the accompanying symptoms in the bone and periodontal membrane may be considered as results of vitamin C deficiency.

An exception is the report of Weisberger (1938) who stated that "various degrees of parodontal disease were present when blood ascorbic values were less than 0.7 mg. per cent." However, he found that vitamin C therapy alone failed to produce a complete cure in certain long-standing cases associated with partial deficiency.

It is quite probable that in periodontal cases with a history of limited diets, vitamin C deficiency may be a factor. Low vitamin C intake has been found in association with gastro-intestinal dysfunction or disease, with deficient diets prescribed in colitis or allergic states and with dislike of ordinary foods (Weisberger, 1938; Croft and Snorf, 1939).

### BLOOD PLASMA ASCORBIC ACID LEVELS

To better understand a discussion of vitamin C, it would be well to review the accepted evaluation of the various levels of blood plasma, vitamin C or ascorbic acid content. According to Todhunter (1940) and Smith (1939), from 0.0 to 0.4 mg. is accepted as indicating a very poor state of vitamin C nutrition; from 0.4 to 0.8 mg. is moderately good, and from 0.8 to 1.2 mg. is very good, while values above 1.2 mg. per hundred cubic centimeters of blood plasma indicate full saturation, or excellent vitamin C nutrition.

Blood ascorbic acid levels should not be the sole criterion of the state of vitamin C nutrition. In a series of 100 unselected hospital patients who were of an economic and social status that would presuppose a sufficiency of any desired diet, thirty-eight were found to have blood plasma ascorbic acid concentrations below 0.4 mg. per hundred cubic centimeters, with three between 0.1 and 0.2, and yet no cases of clinical scurvy were recognized (Croft and Snorf, 1939). Lund and Crandon (1941), after human experimental scurvy studies, concluded that a blood plasma level of zero does not necessarily mean the presence of scurvy or even of a vitamin deficiency that is close to clinical scurvy. Minot and his associates (1940) found that even careful x-ray study when the blood level was known to be below 0.2 mg. failed to reveal characteristic evidence of vitamin C deficiency; also, that values of from 0.3 to 0.7 mg. indicate restricted intake, but may or may not be associated with any serious undersaturation of tissues. Kastlin and his co-workers (1940) say that "to determine the state of vitamin C nutrition, chemical data should be considered in association with the clinical condition of the patient, and the combined considerations must be based on the fundamental factors which influence vitamin C requirement and utilization by the body."

Apparently, only small amounts of vitamin-C-rich foods are needed for maintenance of satisfactory ascorbic acid blood levels. Howe, Bessey and White (1941) write:

> An optimum ascorbic acid blood level was found to be maintained in healthy children between the ages of 4 and 10 years on a regular daily intake of 3 ounces of orange or grapefruit juice or 6 ounces of tomato juice (or the equivalent in whole fruits). . . . Other sources, such as potatoes and vegetables, raw and cooked, contributed to a sufficient degree to prevent scurvy, but the quantity of these foods habitually consumed was insufficient to maintain the ascorbic acid level in the blood within the desired range.

Similar findings have been given by Herlitz (1938). Weisberger (1938) found that daily consumption of 2 ounces of orange juice enabled twelve of fifteen adults to maintain both blood values and the observed clinical improvement of the oral tissues.

TABLE 2.—VITAMINS LOST IN COOKING POTATOES

| | | Bryan and Turner | Bessey | Murphy |
|---|---|---|---|---|
| New potato: | 100 gm. or 1 small, or ⅔ c. | (November to | | |
| Raw: | diced | March) | 15 mg. | 17 mg. |
| Cooked: | | | | 10 mg. |
| Old potato: | | | | |
| Raw: | | | 7 mg. | 11 mg. |
| Cooked: | | 1 to 10 mg. | | 6 mg. |

### VITAMIN C DAILY REQUIREMENTS

Vitamin C must be supplied daily. The minimal and optimal quantities required

are the subject of controversy. This may be due partly to a difference of opinion as to the standards which should be used in judging adequacy of intake and partly to a possible increased need under certain conditions, among which may be exercise, infections, interference with assimilation because of gastro-intestinal disturbances or administration of certain drugs.

The daily requirement for the prevention of scurvy in an adult has been variously estimated as from 15 to 25 mg. of ascorbic acid (Rose, 1939; Smith, 1939), or the physiologically indispensable minimum. The severe symptoms of scurvy, "soreness and stiffness of joints, swelling and bleeding of gums with loosening of teeth, and hemorrhages under the skin on various parts of the body" are seldom seen in this country (Smith, 1939). Experimental studies have shown other cellular changes with varying levels of vitamin C deficiency. These indicate the need for a standard representing the amount assuring a state of health that could not be bettered by further additions of vitamin C.

Many investigators believe that optimal nutrition, the state of health which cannot be bettered, is best secured by giving all the vitamin the body can hold. This state is commonly called saturation, and is measured by the spill-over of vitamin C into urine that occurs after repeated large doses of the vitamin are given. (Smith, 1939.)

Even though it is not universally accepted that to maintain the tissues in a constant state of saturation is desirable, it is obvious that the daily requirement under ordinary circumstances cannot be greater than the minimum amount which will maintain such a state of saturation. The saturation requirement in one study ranged from 70 to more than 100 mg. of ascorbic acid daily, or from about 1 to 1.6 mg. per kilogram (2.2 pounds) of body weight daily (Smith, 1939). Harris (1940) said that if the diet was good and an orange was eaten daily, none of the patients tested were below the standard of excretion.

TABLE 3.—VITAMIN CONTENT PER HUNDRED GRAMS OF CERTAIN VEGETABLES*

| | | |
|---|---|---|
| Cabbage | 1½ c. raw | 20-44-100 mg. |
| Peppers | | |
| Green | | 90-124 mg. |
| Red | | 230 mg. |
| Rutabagas | | |
| Raw | | 30 mg. |
| Cooked | ½ c. mashed | 6 to 13 mg. |
| Kohl rabi | | |
| Raw | ½ c. diced | 30 to 70 mg. |
| Cauliflower | | |
| Raw | | 30 mg. |
| Cooked | ⅔ c. | 12 to 40 mg. |
| Brussels sprouts | | |
| Cooked | ⅔ c. | 30 to 48 mg. |

*Quoted from Bryan and Turner; Munsell, and Bessey.

TABLE 4.—VITAMIN C CONTENT PER HUNDRED GRAMS OF CERTAIN COMMON FOODS*

| | | |
|---|---|---|
| Lettuce | ¼, 4 inch head | 2-5 mg. |
| Carrots, raw | | 3-8 mg. |
| Carrots, cooked | ⅔ c. | 0-5 mg. |
| Celery | | 1-2 mg. |
| Peas, cooked | ⅔ c. | 2-6 mg. |
| Applesauce | ⅔ c. | 0-3 mg. |
| Apricots, cooked | ½ c. | 1-7 mg. |
| Banana (1) | 6½ inch long | 5-11 mg. |
| Fruit cup, canned | | 2-3 mg. |
| Grape juice | | 0 |
| Peaches, canned | 1 medium | 6-10 mg. |
| Pineapple juice | ½ cup | 6-18 mg. |
| Pineapple, canned | 2 slices | 10-20 mg. |

*Quoted from Bryan and Turner.

### VITAMIN C DAILY STANDARDS

Normal adults on the same basal diet and with the same vitamin C intake will differ in vitamin C excretion and in their response to test doses (Todhunter and Robbins, 1940). To provide a margin of safety for this individual difference in utilization and also for the variation in the content of foods, a standard greater than the minimum requirement of vitamin C must be set. The accepted standard, or daily allowance, is from 50

to 100 mg., depending on the authority quoted. The allowance is not difficult to obtain, for as Sybil Smith (1939) comments, "For those accustomed to taking a glass of orange juice or other fruit juices, grapefruit, or fresh berries in season as a matter of course at breakfast, there is little danger that the total daily intake of vitamin C from all sources will furnish less than 75-100 milligrams daily." (A half-cup of orange juice will supply 50 milligrams of ascorbic acid, according to the figure generally given.)

In recent studies by the Bureau of Home Economics (Striebling and Coons, 1939), the middle 50 per cent of the diets of white families provided 50-100 mg. of ascorbic acid per day. These averages represent the value of uncooked food and thus are higher than actual consumption because of losses in preparation and storage. The survey brought out regional differences in vitamin C consumption. The ascorbic acid content of the diets at all cost levels was consistently higher in the Pacific than in the North Atlantic region for the city families, the only group for which data were given for both these regions. These differences were shown even more strikingly in the detailed report on the diets of families of employed wage earners and clerical workers in cities.

If, as some believe, bleeding gums and gingivitis are among the first symptoms of vitamin C deficiency, one might look for a significant difference in incidence of gingivitis or periodontitis between these two regions. Further, it has been shown that there has been a substantial rise in vitamin C consumption (Striebling and Coons, 1939; Gillette and Rice, 1937) throughout the United States. Has a decrease in incidence of gingivitis followed?

With the present data on vitamin C and the shift in consumption of certain foods in mind, it appears that complete lack or even an exceedingly low intake of vitamin C will not be encountered in the average periodontia patient. No doubt, individual instances of low C intake are found in those cases in which diets have been limited for therapeutic or other reasons. Yet, generally, when the vitamin C intake is low, multiple dietary deficiencies will be present. Therefore, each patient suspected of vitamin C deficiency should be studied from all aspects. It is wise to obtain dietary histories routinely. The history should include every bit of food eaten in one week, even between-meal snacks. From this, a satisfactory estimate of the diet can be made; not only as to vitamin C, but also as to other recognized factors. For most persons, a satisfactory daily diet should include the following foods (supplemented by some form of vitamin D):

Meat: One serving of meat, fish, or fowl daily; or at least five times a week.

Milk: One pint to one quart daily.

Eggs: One or two daily, or at least five a week.

Butter: One or two tablespoons daily.

Vegetables and fruits: Five servings daily:

One serving of citrus fruit or tomato.

One serving of potato.

One serving of green or yellow vegetable.

Two other servings of fruit or vegetables.

Cereal foods (foods composed predominantly of grain products): Four to six servings daily, with at least half of wholegrain or enriched cereal.

Dessert: Once daily, twice only when it will not displace protective foods.

It is well known that the vitamin content of foods is not fixed. There is variation from sample to sample of any food tested. However, not less than 50 mg. and probably far greater amounts of vitamin C will be supplied if the suggested quantities and types of fruit and vegetable are included each day. Sherman has said,

It is high time to teach confidently that the purchase of fruit is no longer to be re-

garded as a luxury. It is an investment in health or in higher health—in buoyant as contrasted with merely passable health. (Quoted by Fenton, 1940).

### VITAMIN C SOURCES

Different varieties of the same food contain different amounts of vitamin C. Delicious apples contain 2.5 mg. per hundred grams. Winesaps have 5 mg.; with others up to 12 mg. Some tomatoes contain twice the amount of other varieties. In spite of the variation, tabulation of values identifies important food sources.

In addition to the original variation in vitamin content, storage and preparation allow a greater loss of vitamin in certain types of foods. Citrus fruits and tomato show little change in vitamin content over fairly long periods (Munsell, 1941). Therefore, the most dependable sources for the daily needs of the average person are citrus fruits and tomato, although fresh fruit in season, such as strawberries and cantaloupe, may take their place.

To better visualize the vitamin contribution of citrus fruit, the approximate equivalents of vitamin C and orange juice (Smith, 1939) are set forth:

| Vitamin C | Orange Juice |
|---|---|
| 2.5 mg. | 1 teaspoonful |
| 7.5 mg. | 1 tablespoonful |
| 12.5 mg. | 1 fluid ounce |
| 50.0 mg. | ½ cupful |

Grapefruit, lemons and tangerines have approximate values.

Representative values for 100 gram portions of tomato, strawberries and cantaloupe are shown in Table 1.

Those people who have an idiosyncrasy or allergy to these vitamin C rich foods must pay far greater attention to the composition of their diets if ample vitamin C is to be assured daily.

Before citrus fruits and tomato became common daily foods, potatoes were the significant ascorbic acid sources because of the frequency of daily inclusion in the diet and the relatively large quantities used, often at two or three meals. Potatoes too show a great variation in vitamin content, particularly associated with length of storage. Murphy (1941) found that freshly dug potatoes contained twice the vitamin of those stored until spring. On this basis, to supply 50 mg. of ascorbic acid would require three and one-half potatoes of 5⅓ ounces each (about 500 calories), peeled and boiled, in the fall, and seven such potatoes in the spring. Thus, one serving of new potato will ordinarily meet a significant portion of the scurvy-preventive needs. According to Bessey (1939), there is only a slight loss in the cooking of potatoes, but Murphy shows a 40 to 50 per cent loss. (Table 2.)

Sweet potatoes are far richer in vitamin C. One half of a medium sized baked sweet potato (100 gm.) contains from 10 to 25 mg.

Some foods are excellent sources of ascorbic acid, but are not used frequently enough in most diets to be significant contributors. These include many of the "old-fashioned" vegetables, such as fresh raw green cabbage, green and red peppers, rutabagas and kohl rabi, and cauliflower and brussels sprouts. Representative values per hundred grams are given in Table 3.

Many people think that so long as they include fruits and vegetables in the diet, the vitamin C needs will be met; but many fruits and vegetables are not the good sources of vitamin C that they are often thought to be. Some of the foods in this class and their representative values per hundred grams are listed in Table 4.

These foods are exceedingly valuable in the diet to provide other vitamins and minerals, but they are not very important from the vitamin C standpoint.

In addition to the original vitamin C content of the food, its value when ready for serving depends on the length and methods of storage and preparation. The

mean values of field and garden fresh fruits and vegetables are greater than those market fresh. For example, spinach picked and kept two to three days has a 50 per cent loss.

The amount of surface exposed is important. Even shelled peas lose 25 per cent in twenty-four hours, as contrasted to 10 per cent if kept in the pod. The more nearly perfect the surface appearance of the food, the greater the vitamin content, since crushing and bruising of raw food increase the activity of the ascorbic acid oxidizing enzyme. To lessen the loss of vitamin C, finely cut foods should be prepared shortly before serving.

In cooking, the quicker the food is brought to a boil, the less the destruction, because the enzyme is inactivated more rapidly; but the greater loss in cooking is due to solution of the vitamin in the water. This amounts to from 20 to 66 per cent (Fenton, 1940). The extent of dissolving and destruction depends on the cut surface, amount of water, time for attaining the boiling point, length of cooking and the vegetable itself. Because of the greater exposed surface, finely shredded cabbage when boiled loses much more vitamin than if quartered. Because of the increased time required for cooking, baked potatoes actually lose more than those quartered and boiled (Fenton, 1940), though baking is best for preservation of minerals, protein and carbohydrate.

Keeping cooked vegetables warm, as is done in many restaurants, causes a great loss of vitamin C, as does refrigeration and reheating of cooked vegetables. There is some loss in the blanching and preparation of foods for freezing, but the latter process itself causes no loss. There is little loss of vitamin C in tomatoes during home canning, either hot or cold pack, but there may be from 30 to 60 per cent loss during six months' storage of the canned product (Fenton, 1940). In general, those foods, fresh or cooked, that have the best aroma, color, flavor and texture will contain the most vitamin C.

It is better procedure to use natural food sources to furnish vitamin C in the diet. Todhunter (1940) says:

> Pure ascorbic acid is of value in clinical cases where very high doses must be given or where food cannot be tolerated. It is invaluable for research, but in all other instances natural food sources should be used.

There are many data indicating that the body uses vitamin C from foods better than pure ascorbic acid. That may be because of contributions of other minerals and vitamins, metabolic processes or some essential factors as yet unrecognized. Many investigations (Chaney and Blunt, 1925; Williams and Macy, 1941; Shepard, Macy, Hunscher and Hummel, 1940) show the greater effectiveness and superior nutritive advantage of fresh orange juice over ascorbic acid. Other research (Scarborough, 1940; Todhunter, Robbins, Irey, Brewer, 1940) provides evidence of the possibility that lemon juice or other rich food sources of vitamin C contain another factor concerned in the prevention of hemorrhages, which are now often considered characteristic of scurvy. All this suggests the inadvisability of dependence upon pure chemicals for meeting the routine daily requirement of vitamins.

## SUMMARY

"Today," as stated by Taylor, "science, transportation and industry have made available a vast array of foodstuffs from which we are at liberty to select any conceivable type of diet. With this unusual privilege goes the responsibility to choose sensibly and wisely. Our goal should be the development of sound food habits based, not on chance customs or personal tastes, but on the proven facts of nutritional science and education."

Too often, the diet is calorie-rich, but

qualitatively poor, not because of financial inability to purchase the right food, but because of ignorance of food values, and faulty dietary habits. Unfortunately, when there is a poor diet qualitatively, the results may be serious, but less obvious. To safeguard the tissues from dietary inadequacy, the established nutritional principles should be followed, and thus all the elements, which are needed to maintain the oral tissues in good health will be provided.

There is considerable research which shows that the vitamin C present in 3 ounces of citrus fruit juice or 6 ounces of tomato juice will maintain the blood ascorbic acid level within the desired range. If proper care is taken, similar amounts of vitamin C can be obtained from certain other foods.

In patients on "limited" diets, a partial vitamin C deficiency may be a factor in periodontal disease, but it appears that low intake is not to be expected as a predominant factor in the average case. Even with suboptimal intake, vitamin C therapy alone cannot be expected to assure a cure.

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# THE BIOLOGIC APPROACH TO PROBLEMS IN AVIATION DENTISTRY

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AVIATION medicine is expanding day by day and has become a subject of world-wide interest. The authorities and writers in this field, through investigations, observations and research, have gone forward on a par with engineering science to make man's conquest of the air as effective and safe as possible. However, we feel that little has been accomplished in the field of aviation dentistry, and so, for what it may be worth, and with the hope that our efforts may stimulate others to carry on, we offer the following.

The impetus given to the growth of the aviation industry by the demands of modern warfare has made clear the dangers that usually accompany such a marked advance. Industrial hazards in other fields have long been recognized and dealt with. In this new industry, some of the perils and pitfalls have been counteracted, but, as yet, many problems remain unsolved.

Modern military aviation, with fast, highly specialized fighting craft, brings up such new problems as speed, high altitude and extreme ranges of temperature. These become apparent in the daily routine of the pilots, and it is for them as well as for the future flying public that it becomes imperative to increase the interest in these problems. We wish to stress the importance of interest in the conditions which may cause dental deterioration and to emphasize the biologic approach to these problems, as we believe that therein lies their solution.

An interesting paper, "The Effect of High-Altitude Flying on Human Teeth and Restorations," by Harry G. Arm-

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strong, M.D., and Russel E. Huber, D.D.S., Dayton, Ohio, appeared in the *Dental Digest,* March 1937. The authors say,

The teeth are normally subjected to three distinct abnormal variations in environment during high-altitude flights: decreased barometric pressures, low oxygen percentages, and lowered atmospheric temperatures.

The conclusions reached were that environmental conditions encountered at altitudes between 10,000 and 40,000 feet have no deleterious effect on human teeth or dental restorations. However, when we consider the deleterious effects of these three distinct abnormal variations in environment on other parts of the body, and realizing that the tooth is but another organ of the body and subject to the same physiologic laws, we must expect similar effects upon the dental pulp. Biochemical and physiologic changes which enter into the picture with other organs have a bearing on dental pulp changes.

Let us renew a study of the pulp. Anatomically, the tooth, like any other organ in the body, depends for its sustenance on its blood supply. This blood supply, which is very rich, is present in the pulp, which possesses a curious anatomic make-up. According to Endleman, of the University of Southern California:

The dental pulp is the soft tissue contents of the pulp chamber and root canals of the teeth. It is in close relation with the peridental membrane at the apical foramen. It presides over the formation of dentin during the developmental period of the tooth and throughout the life of the tooth in response to physiologic and pathologic stimuli. It occupies the pulp chamber in the crown of the tooth and the root canal, or canals, in the roots of the tooth. It resembles embryonic tissues in its delicate fibrillar basis, and in its cells, which are round, oval or stellate. It is the sensory organ of the tooth and the source of the blood and nerve supply of the dentin. After the dentin attains its full development, the pulp deposits new dentin through the agency of its odontoblasts, under conditions of abnormal stimulation and as a physiologic manifestation of increasing age.

The pulp has, relatively speaking, a rich blood supply. During the formative period of the tooth, the blood is carried to it by means of several arteries. When the development of the tooth is complete, the blood supply consists, as a rule, of one small artery and a correspondingly small vein; or, again, it may consist of three or more arteries with their corresponding thin-walled veins entering the tooth through one or several foramina. Weil has found that from three to ten blood vessels may enter the tooth through the apical foramen. The arteries break up into numerous branches, which are distributed throughout the substance of the pulp. These branches, as they reach the odontoblastic layer, split into capillary plexuses, which lie in close proximity to the odontoblastic cells, from which veins carry off the blood. The walls of the vessels of the pulp are very thin and are easily affected by changes in blood pressure.

As there is no collateral circulation in the pulp, any injury to the blood vessels at the apex affects the vitality of the entire pulp. As shown by A. Hopewell-Smith, its veins are valveless and noncollapsible. The pulp, because of the character of its blood supply (being devoid of collateral sources of nutrition), because of the character of its immediate surroundings (hard and unyielding) and because of the liability of its protecting tissues (enamel, dentin, cementum) to disease, which decreases their power to act as barriers against disease-producing influences (thermal, chemical and bacterial), is susceptible, in an exaggerated degree, to diseases which in the vast majority of cases impair its vitality permanently. The pulp is subject to a number of diseases of bacterial origin which lead to septic pulpitis and death of the organ. It is also subject to retrograde as well as to constructive meta-

morphoses, such as fatty hyaline and colloid degeneration, calcareous infiltration of the pulp, calcification of the dentinal tubuli and the formation of pulp nodules and secondary dentin. The amount and the composition of the blood, which varies in the presence of such systemic pathologic states as affect the lungs, heart, kidneys, spleen, etc., doubtless exert some harmful influence upon the nutritional processes in the pulp. Anemia, chlorosis or leukemia may cause cell degeneration in the pulp.

Talbot's investigation demonstrates the general predisposing causes of pulp vascular changes which interfere with the resistance of the organ to the exciting causes of the pulp disease, which may be bacterial, thermal, chemical or physical. Among the local predisposing causes, A. Hopewell-Smith gives prominence to degenerative changes in the cells of the pulp, brought about by insufficiency of arterial blood supply and venous drainage, the result of constriction of the apical foramen or foramina. He says changes in the quantity and quality of the blood, as the result of chronic intoxication in any of the viscera, and of nervous disorders, bring about cell degeneration in the pulp, which gradually impairs its vitality and shortens its period of physiologic usefulness. The changes in blood pressure, which affect the arteries throughout the body, must necessarily also leave their impress upon the vessels of the pulp. It is thus that we may explain the pulp hyperemia which develops in the course of such acute infections as influenza and bronchitis.

As has been demonstrated by these dental authorities, the pulp has no collateral arterial circulation. If the main artery is diseased or injured, the peripheral supply of blood will suffer, the nutrition to the tooth will become impaired and the pulp will undergo extensive pathologic changes. Furthermore, the veins of the pulp, lacking valves and not being able to collapse, make regurgitation and venous stasis possible, from any minute disturbance. Again, "its enclosure in a hard, unyielding wall of dentin" unfits it for efficient, immediate and permanent response to environmental changes. Further, since there is no definite pattern of lymphatic drainage, waste products and other exudates are disposed of with difficulty, and so the pulp vitality is at a low ebb.

Physiologically, the pulp reacts to various influences in a rather special manner, although not unlike other tissue. Vasodilatation and hyperemia follow a reflex vascular spasm, with transudation and edema a consequence. With the stimulus to such spasm removed, there would ensue a regression of the edema by virtue of restoration of vascular tonus. A continuation of the process, with increasing pressure, but with slow regression, would lead to degeneration involving atrophy, fatty changes, necrosis or calcification. Although any of these processes might be arrested by removal of the cause, irreparable damage may have been effected.

The relation of all these considerations to flying becomes evident when we realize the marked changes which the body undergoes in this new environment. It seems reasonable to assume that, with marked changes in other bodily structure, the dental apparatus is likewise affected.

From the anatomic point of view, the absence of valves in the pulp veins, as shown by A. Hopewell-Smith, makes probable regurgitation and venous stasis, when we consider the pull of centrifugal force present as a flier makes a bank or pulls up at tremendous speed. The blood mass in the body tends to move in the direction of centrifugal force, which acts in the direction of the original line of flight. Since the pilot is seated upright, the effect of this force is directed through the body from head to seat. The result is that the blood is suddenly withdrawn from the brain, a sudden anemia,

or "blackout," resulting. This "blacking-out" process is common knowledge, but it is not conceivable that the tooth "blacks out" in the same process? Moreover, the absence of any recoil mechanism in the hard, unyielding wall of dentin makes it seem unlikely that recovery from a "blackout" in the tooth would be so efficient or so nearly complete as in the brain.

Considering the physiologic processes, we find that vascular spasm with vasoconstriction and vasodilatation comes into play with teeth as well as with other organs. In extreme cold, such as occurs at high altitudes, it is conceivable that prolonged vasoconstriction of the pulp vessels might lead to such degenerative changes as atrophy, fatty change, necrosis or calcification. It is apparent too that the effects of aero-embolism, such as occurs with a rapid ascent, might involve pulp structures as well as the joints, the brain and the middle ear.

Aero-embolism, or "bends," is a low pressure sickness caused by the evolution of bubbles in the blood and other body fluids. These bubbles consist of nitrogen, carbon dioxide and water vapor. As has been shown by the Aero Medical Research Unit at Wright Field, Ohio,

> . . . this bubble formation is due to the fact that the gases dissolved in the body fluids at ground level pressure exist in a state of supersaturation at the decreased pressures of high altitudes, and bubbles begin to form in a manner similar to those in a bottle of charged water when the cap is removed.

The release of these compressed bubbles is generalized through the vascular system and so would also involve the dental pulp. The occurrence of the phenomenon in joints causes the common picture of the "bends." This is but a physiologic attempt on the part of the organism to accommodate for the hemorrhage which occurs when this bubble formation bursts the vessels; but the pulp is surrounded by a dense, unyielding wall of dentin which cannot "bend" to accommodate. The effect then would be most deleterious.

With respect to the biochemical changes occurring in high altitude flying, and its effect on the pulp, the possibilities of pulp injury are inescapable. Without the use of oxygen equipment, which is even today being only very slowly accepted by pilots in general, anoxemia is the hazard to the body, including the dental pulp. Anoxia is closely related to the chemical reaction of the blood, and hence alkalosis or an increase of the hydrogen ion concentration is one of the chief dangers. As a result of alkalosis, arteriolar constriction occurs, with ensuing ischemia, or local diminution of blood supply. As is quite apparent, ischemia in a tooth pulp, which is already devoid of any great amount of circulatory capacity, is a severe handicap to preservation of that structure.

To summarize all the potentialities for pathologic development, it seems necessary to call for greater effort in investigating the dental problems which must arise in modern aviation. Dental science has contributed little in this direction. The dental profession has in aviation dentistry an opportunity to show its initiative, resourcefulness and vision.

Air Corps Training Detachment.
411 Barnes Building.

# A CLINICAL AND ROENTGENOGRAPHIC STUDY OF PERIODONTIC PROBLEMS IN CHILDREN WITH SYSTEMIC DISEASE*

By C. Harlan Blackstone, D.D.S., Iowa City, Iowa

THE study of periodontology has been concerned with the adult patient in the main in past years. However, recent trends in preventive dentistry emphasize the importance of studying periodontic problems in children. It is commonly taught that the child should first come to the dental office not later than the age of 2½ or 3 years. Such a routine will permit the earlier finding and analysis of the individual periodontal problems and will enable the practitioner to preserve the foundation for the teeth in question.

Dental literature frequently refers to the fact that oral lesions and infections may have an effect upon the general health of the patient. Likewise, it should be stated that systemic disease, infectious or deficiency, often has an effect upon the oral structures. Exogenous factors such as lack of dental attention, faulty restorations and malocclusion have long been recognized as possible sources of periodontic problems. In this instance, I wish to present a few of the endogenous factors which contribute to the oral health of the child and young adult patient. This presentation will deal principally with diabetes mellitus and congenital syphilis. In addition to these, the oral manifestations of scurvy or aplastic anemia in certain child patients will be reported.

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*Study made under the direction of John C. Brauer, D.D.S., M.Sc., head of the Department of Preventive Dentistry and Pedodontics.

Read before the Section on Periodontia at the Eighty-Third Annual Meeting of the American Dental Association, Houston, Texas, October 29, 1941.

### DIABETES MELLITUS

Diabetes mellitus, a fairly common disease, is the result of an insufficient output of insulin from the islands of Langerhans in the pancreas. Insulin is concerned primarily with the metabolism of sugar, and, with an insulin deficiency, there is an increase in the concentration of sugar in the blood and in the urine. The general symptoms that may be recognized by the dentist are: frequency of urination, increase in thirst, increase in appetite, decrease in weight and dryness of the skin. The breath in an uncontrolled case may have a fruity odor. In some instances, the disease is not recognized until the stage of coma. Occasionally, a child with previously unrecognized diabetes may have an injury which will not heal. During the physical examination, the general and specific findings of diabetes will be noted. Dental infection has been known to be the exciting cause in the disease. Miller,[1] in a discussion of uncontrolled diabetes, says, "We have seen cases in which the extraction of a few infected teeth resulted in the reduction of the blood sugar and an amelioration of the diabetes because here, apparently, the exciting onslaught upon the weakened islands came from that source."

An interesting case was that of a boy 13 years of age who came to the hospital because the gum tissue would not heal

after the extraction of the upper left second bicuspid and the first permanent molar. The two teeth had been extracted eight weeks earlier. In a routine physical examination, the diagnosis of diabetes mellitus was made. Regular diabetic treatment resulted in the normal healing of the area. (Figs. 1 and 2.)

It would therefore seem best, in such uncontrolled cases, to advise that extractions or dental surgical procedures be attempted only after the patient is under medical treatment. Sometimes, it is difficult to get adequate metabolic control of a patient who still harbors infection. There is no hesitancy in the dental clinic of the University of Iowa Children's Hospital to remove teeth or to perform surgical operations when the patient is receiving adequate medical attention.

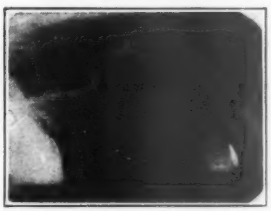

Fig. 1.—Edentulous area in mouth of boy aged 13 whose gum tissue would not heal after extraction of upper left second bicuspid and first permanent molar. In a routine physical examination, the diagnosis of diabetes mellitus was made.

There is little if any difference in the healing power of a controlled diabetic patient and a well person.

Various opinions and conclusions have been presented concerning the effect of diabetes mellitus upon the oral structures of children. Sheppard[2] reports a group of ten diabetic patients, aged from 10 to 19 years, in which nine had little or no resorption and one had almost a complete loss of alveolar bone. Bonheim[3] states, "It appears to be proven that there is no close connection between diabetes and periodontoclasia." Cahn[4] says,

I do no believe that there are such specific disease entities as, for example, diabetic gingivitis or pyorrhea, and pregnancy gingivitis. There are thousands of diabetics who never develop pyorrhea.

Contrary to the opinions just cited is Schour's[5] statement: "The association of pyorrhea with diabetes is generally accepted." Ersner[6] refers to a study of sixty cases in which 95 per cent of the patients had pyorrhea and caries, and pyorrhea was more prevalent in diabetes than in any other systemic disease. Rutledge,[7] from the University of California Division of Dental Medicine, says,

The clinical and roentgenographic study of twenty diabetic children between the ages of 8 and 18 revealed that gingival and periodontal disturbances are frequently present. In 80 per cent (sixteen cases), definite symptoms of gingivitis, marginal vertical and horizontal atrophy, and also marginal widening

Fig. 2.—Area shown in Figure 1. The gum tissue healed rapidly after routine diabetic treatment was instituted.

of the periodontal membrane space, could be found, alone or together.

Rutledge further states that, in eighteen cases, there was a decided disproportion in the size of the crowns and roots. Seven of the twenty cases had pointed roots and eighteen of the cases had large crowns.

The results of the study at the University of Iowa Children's Hospital are as follows: One hundred eighty-eight cases were studied wherein the ages varied from 15 months to 16 years. Some of the patients have been under routine observation several times a year for a period of 12 to 15 years. The average period of observation for the entire group of 188 patients was 4.7 years. Fifty-five

Fig. 3.—Dental structures of patient aged 14 who had been under diabetic regimen for seven years. The tissues and bone structures were in excellent condition throughout treatment.

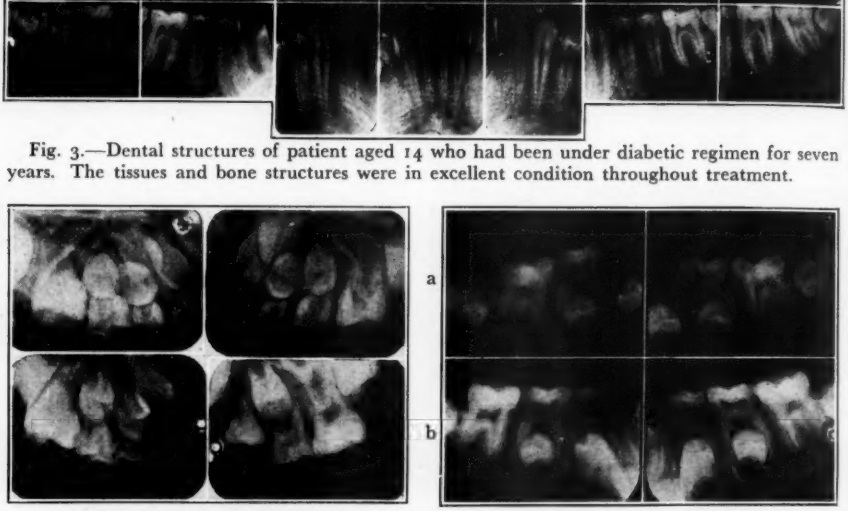


Fig. 4.—Progressive bone resorption from age 6½ years to age 8 years 11 months. Diabetes was first apparent at 18 months. Above: a, appearance of tissues in June 1938, at age 6½ years. b, left, appearance in November 1940, at age 8 years 11 months. b, right, appearance in September 1939, at 7 years 9 months. Below: c, appearance in April 1940, at 8 years 4 months; d, appearance in November 1940, at 8 years 11 months.

per cent of this entire group of 188 children had poor oral hygiene, while the remaining children had fair to good oral hygiene. Only 28 per cent had normal, well-defined gum margins without some degree of gingivitis.

Approximately one-third of the patients had varying degrees of calculus in the mouth at the time of the initial examination. Only 7 per cent of the group failed to develop calculus during the period of observation. It is interesting to

note that when the patients were placed on the hospital regimen, which comprises an adequate nutritional program with regulated insulin intake, 18 per cent developed calculus deposits about the teeth within a period of three months. One-fourth of the patients were on a diabetic controlled regimen for a year or more before any deposits of calculus were found in the mouth. After the initial deposit of calculus, it was intermittently present throughout the entire subsequent period of observation. I have no explanation of the presence of calcareous deposits under good control do have calculus and that such calculus persists many times for a period of years is evidence that this is not a pathologic condition. The fact that such patients under good control do not have any alveolar bone destruction when observed for a period of years is additional evidence that the patients in question are in good dental health. (Fig. 3.)

Twenty-three per cent of the patients had a normal, well-defined alveolar bone pattern throughout the period of observation, indicating that adequate control

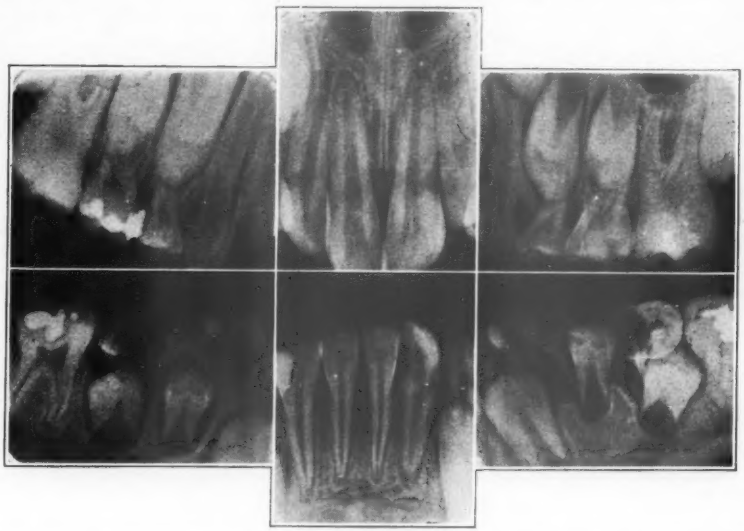

Fig. 5.—Dental structures of diabetic aged 8; showing moderate bone destruction. Resorption in the lower arch is due to an infectious process rather than the diabetes.

in the well-controlled patient. Inadequate control or incomplete supervision of diabetes mellitus may play a part in initial and possibly progressive loss of the alveolar bone. Poor control may also influence the calculus formation in some patients.

It must be emphasized, however, that the presence or absence of calculus does not necessarily mean that the patient is in a poor state of diabetic control. The fact that the majority of the patients and dietary management had been maintained. In another 21 per cent, the roentgenograms suggested beginning bone resorption, although many of this 21 per cent were observed during intervals of tooth eruption when it is difficult to reach any positive conclusion. Twenty-five per cent showed moderate to severe resorption of the supporting bone structures.

The resorption of the alveolar process takes place in the deciduous dentition as

well as in the adult dentition in those cases in which the disease is not under control or complete supervision. Rutledge[7] refers to the work of Gescheff:

In 1931, Gescheff reported the presence of lipoids in paradental tissues in cases of diabetes after Berberich had found that, in nearly all cases of diabetes, a hypercholesteremia of the blood existed. In the course of his histologic examinations of gum tissues and paradental granulation tissue of diabetic patients, Gescheff noted, in five out of six cases, round-cell infiltration in the subepithelial connective tissue, with an abundance of fatty depositions. He concluded that these fatty infiltrations in the inflamed paradental tissue were the result of the diabetic lipemia, which lowers the resistance and decreases the healing tendency of paradental lesions. According to Gescheff, these anatomic findings seem to explain the predisposition or constitutional tendency to paradentosis.

The dental roentgenograms of a case of marked alveolar bone atrophy are shown in Figure 4.

The patient, a young girl, developed diabetes at the age of 18 months. A roentgenogram was taken at the age of 6½ years, in June 1938; another in September 1939; another in April 1940. Progressive bone resorption may be noted, particularly in the lower first primary molar areas. The lower right first primary molar had been completely lost by April 1940, at the age of 8⅓ years.

Another patient, 8 years old, in the case in Figures 5 and 6, already had bone destruction at the initial dental examination, January 5, 1934. Subsequent roentgenograms dated January 25, 1939, need no interpretation. In this boy, now 13 years of age, regeneration of bone cannot be expected. Therefore, a full-mouth extraction will be necessary. This patient did not follow the dietary or insulin regimen prescribed. The blood cholesterol concentration in April 1939 was 219 mg. per hundred cubic centimeters. The normal blood cholesterol concentration is generally considered to be between 150 and 230 mg. per hundred cubic centimeters.

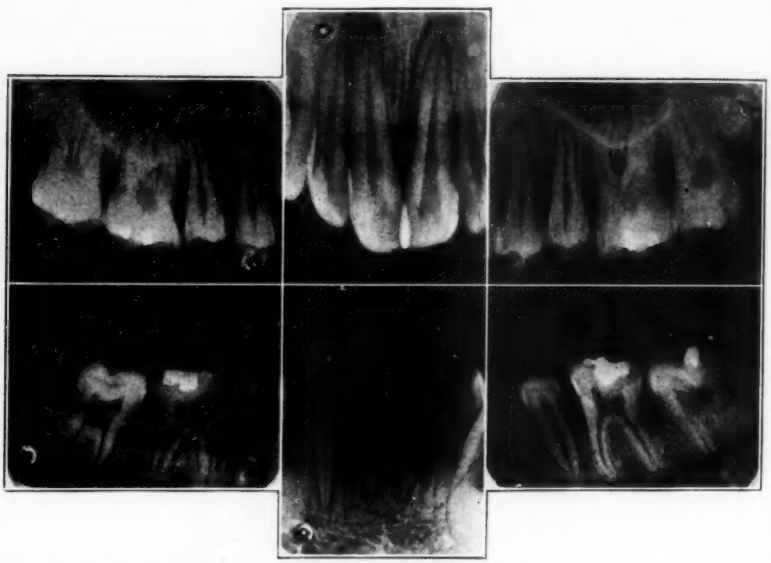

Fig. 6.—Dental structures of patient referred to in Figure 5, at age 13. Extensive bone resorption has resulted from failure to follow the prescribed dietary and insulin regimen.

### CONGENITAL SYPHILIS

A study of thirty-nine patients with

congenital syphilis was made the past year wherein the age level ranged from 9 months to 17 years. The principal objective of the study was to determine the relative incidence of dental stigma associated with syphilis in both the deciduous and the permanent dentition.

It was noted that the periodontal structures frequently show an adverse effect of syphilitic treatment. The children in this study received arsphenamine, bismuth salicylate and mercury with chalk in the course of treatment. Only fifteen of the thirty-eight patients had a normal gingival condition as revealed by

Fig. 7.—Mandibular structure of girl aged 4 with congenital syphilis. There was severe hypoplasia of the enamel of the posterior deciduous teeth, with some evidence of hypoplasia in the anterior teeth. Wearing down of the tooth substance to the pulp resulted in exposure and infection. The bone destruction was probably due to the localized abscess and not to the disease. There was also a mulberry first permanent molar.

dental examination during the course of treatment. There is little doubt that some of the abnormalities found were unrelated to treatment, as were some instances of hyperemia. The incidence of marked hyperemia of the gingival tissues was much greater in this study group (47 per cent of the group) than in the average dental patients. These patients had pyorrhea with resultant bone destruction. I do not have sufficient data to reach any conclusion with reference to the etiology of the pyorrhea in these three cases. It is common knowledge, however, that untreated syphilitic patients do in many instances have a lower resistance to infection than normal patients.

In the case of a girl, now about 4½ years of age, in whom initial antisyphilitic treatment was started June 1939, the roentgenogram made at the age of 4 (Fig. 7) shows considerable bone destruction about the lower right secondary deciduous molar. The severe enamel hypoplasia in this instance permitted the wearing down of the dentin, resulting in exposure of the pulp. In this instance, the bone destruction is probably the result of the infection about the tooth and has not a systemic source. It seems probable that the severe hypoplasia of the enamel of the posterior deciduous teeth, as well as areas of the anterior teeth, was caused by syphilis. Another point of importance is the development of a mulberry first permanent molar, frequently associated with congenital syphilis. This particular first permanent molar will in all probability be hypo-

Fig. 8.—Gingival tissues of girl aged 14 who had severe hyperemia as well as pyorrhea. The patient was a neurosyphilitic. In addition to antisyphilitic treatment, she received 1 grain of phenobarbital twice a day for four years. The continual ingestion of the barbiturates no doubt contributed materially to the condition of the gingivae.

plastic as well as contracted toward the occlusal surface.

The incidence of such mulberry molars in congenitally syphilitic patients was 37 per cent in this particular study. The incidence of stigma in the permanent central incisors was 68 per cent, of which only 21 per cent showed the notching commonly associated with congenital syphilis. The more frequent anomaly was the tapering of the upper central incisor, which was found in eighteen patients, or approximately 50 per cent of those observed.

A girl (Fig. 8), 14 years of age, had severe gingival hyperemia as well as marked pyorrhea, with approximately half of the alveolar bone destroyed. The patient had neurosyphilis. In addition to the antisyphilitic treatment, she received 1 grain of phenobarbital two times a day for four years. The periodontal tissues were highly inflamed. Presumably, this unusual condition of the periodontal tissues was the result of the continued intake of the barbiturates.

Fig. 9.—Bismuth line on gum of patient who had received antisyphilitic treatment.

Eight of the patients had salivary calculus, and ten had the blue-black line of bismuth in the free gingivae. (Fig. 9.) The question arises as to whether the bismuth line is produced by a deposit of the free metal or by a deposit of the metallic salt.[8, 9] Since only ten of the patients had such a line, one questions whether the line is the result of overtreatment or of an unusual oral condition.

SCURVY

The majority of child patients with scurvy, or vitamin C deficiency, are under the age of 2 years, since, after this time, the average child receives more of a mixed diet and is less likely to have this deficiency.[10] Scurvy involves primarily the ends of the bones, especially when growth is rapid. Calcification takes place in a normal manner, but osteoblastic bone formation is inhibited. One of the most characteristic lesions, subperiosteal hemorrhage, appears late in the course of the disease, probably the result of the degenerative changes and the resultant weakness of the vessel walls (increased capillary permeability). Epiphyseal separation also appears late in the course of the disease. In the majority of cases with clinical manifestations, there is pain in the limbs and gingival hemorrhages. In about 5 per cent of the cases, these are the first observed symptoms, but usually they are not seen until the more advanced stages of the disease. When the oral manifestations are well devel-

Fig. 10.—Gum tissues of boy aged 9 with aplastic anemia. There had been no hemorrhage from the gingival tissues. There was a slight gingivitis between two of the anterior teeth. The condition was not of systemic origin.

oped, there is a deep bluish purple spongy swelling of the mucous membrane, usually over the upper incisor teeth.[10]

Of two cases of infantile scurvy seen during the past year one was in a child 10 months old. There were no oral manifestations. However, there was only one lower deciduous central incisor in the mouth. A definite subperiosteal hemorrhage was evidenced in the roentgenographic examination of the femur. The bones of the mandible were negative with reference to such hemorrhages.

The other patient was 15 months old and had lost the use of his arms and legs. The joints and limbs were sore to the touch. The roentgenographic examination confirmed the diagnosis of scurvy. The upper and lower central and lateral deciduous incisor teeth had erupted, the mouth hygiene was very

Fig. 11.—Gum tissue of boy aged 19 with aplastic anemia. There was severe hemorrhage from the gingival tissues as well as other areas of the body.

poor and there was mild gingivitis. There was no evidence of hemorrhage about the teeth even though the patient was considered to be in the later stages of the disease.

The findings of these two cases do not tend to prove or disprove any of the points concerning infantile scurvy. Nevertheless, they illustrate the inconsistency of oral manifestations in scurvy.

The usual treatment of scurvy is administration of several ounces of orange or tomato juice or ascorbic acid or both each day, in addition to the other foods required. The patients just discussed received both the orange juice and the ascorbic acid (100 mg. per day), and each made a rapid, uneventful recovery.

### APLASTIC ANEMIA

The characteristic feature in aplastic anemia consists of the disappearance of the erythroblastic tissue of the bone marrow. The symptoms are those of severe and rapidly developing anemia, with a tendency to hemorrhage in the skin and mucous membranes. The blood shows great diminution of red cells, but there are few if any nucleated red cells. There is a marked leukopenia, due largely to the diminution of polymorphonuclear cells. Platelets are diminished, and coagulation and bleeding time are prolonged. The course is rapid and death usually follows in a few weeks or months, although recovery has been reported. Treatment is supportive, with frequent transfusions of blood.[10]

Three patients with aplastic anemia have been observed the past year, and two cases will be reported here.

1. A boy 9 years of age, who came to the hospital June 11, 1940, weighed 35¾ pounds and was 47 inches tall. He had many dizzy spells at home and was chronically ill. The skin was dry and yellowish, but not jaundiced, and was cold to the touch. The blood count was as follows: red cells, 550,000; white cells, 500; platelets, none; reticulocytes, 1.4 per cent. The bleeding time was more than fifteen minutes; the coagulation time, capillary, one and three-fourths minutes; venous, seven and three-fourths minutes. The hemoglobin was 2.48 gm.

Four transfusions, 500 cc. each, were given, from October 9, 1940, to November 28, 1940. The blood count was as follows: red cells, 3,520,000; white cells, 9,150; hemoglobin, 9.5 gm.

The patient left the university hospital, October 30, 1940, to return in two months. He was readmitted January 19, 1941, when the blood count was as follows: red cells, 550,000; white cells, 3,900; hemoglobin, 1.5 gm.

On admission, the patient had some bleeding from the nose which was hard to control. Throughout the course of observation he had

no gum hemorrhages (Fig. 10). The patient died May 1, 1941.

2. A boy 10 years of age, admitted to the hospital December 4, 1940, complained of ecchymosis and petechial spots over the arms and legs for the past two and one-half months. There also had been bleeding of the gums and epistaxis for two weeks. There was generalized paleness. The blood examination revealed: red cells, 2,110,000; white cells, 3,150; hemoglobin, 4.25.

The blood smears showed the red cells to be normal in size and shape and well filled with hemoglobin. There were no nucleated red cells, and the platelet count was less than 50,000. The patient immediately was given a transfusion of 250 cc. of blood.

The dental examination revealed petechial hemorrhages throughout the mouth. (Fig. 11.) The tissues had the appearance of having been severely traumatized. The blood oozed from the interdental papilla and the gum tissue around the coronal third of the root was swollen and congested, appearing reddish blue. The patient died December 14, 1940.

## SUMMARY AND CONCLUSIONS

Oral surgery, including the extraction of teeth, is not advised in the diabetic child whose condition is not under adequate medical treatment. The extraction of teeth or any oral surgical procedure is considered safe when the case is under control.

Approximately one-third of the diabetic children examined had calcareous deposits at the initial dental examination, and 18 per cent developed calculus within the three months after a routine dietary and insulin treatment were instituted. The presence of calcareous deposits about the teeth in varying amounts may or may not be pathologic. A patient also may have a calculus with optimal nutrition and under insulin control.

It can be concluded from the study of these 188 diabetic children and young adults following a strict dietary and insulin regimen, as well as a thorough prophylactic routine, that such patients will not develop bone and tissue disease due to the diabetes itself. It is believed, however, that children with poorly controlled diabetes are more vulnerable to infection in the hard and soft oral tissues, with resultant tissue destruction, than are children free from this disease.

In the study of thirty-eight congenitally syphilitic patients, it was found that approximately three out of four had some dental stigma, probably related to this infection. Congenital syphilis apparently has no effect upon tooth eruption or exfoliation time. It is evident that antisyphilitic treatment affects the periodontal structures in a large percentage of children. Severe hyperemia occurs more frequently in syphilitic patients than in the non-syphilitic.

The presence of calculus is more prevalent in the diabetic than in the congenitally syphilitic child. This, in all probability, is the result of the better nutritional regimen of the diabetics.

The two young children who had scurvy in the advanced stages, in which subperiosteal hemorrhages were evident, did not show any oral lesions.

The two patients with aplastic anemia presented the common laboratory findings for this disease. The one child had a typical periodontal hemorrhage. The other child presented no acute or serious oral manifestations whatsoever. Both patients died. The conditions discussed in the foregoing have both a medical and a dental connotation.

It is evident that the dental practitioner today has many more responsibilities than he had a decade ago. The field of physiology, bacteriology and pathology have opened many more avenues for diagnosis and treatment, and more will present themselves in the years to come.

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# PHYSICAL FITNESS FOR MILITARY SERVICE AND PUBLIC HEALTH DENTISTRY

By BION R. EAST, D.D.S., New York, N. Y.

THE effect of loss and defects of teeth on the nation's manpower has been receiving deserved attention during the past few months. There are many reasons that this condition should be of particular interest to the public health dentist. Whether the situation warrants it or not, the results of the dental examinations of selectees in the present draft will be used as a measure of the adequacy and efficiency of private as well as public dental service.

The "Physical Findings on Men Drafted in the World War" of 1917-1918 has been published.[1] Forty-four separate causes for rejection are listed. Among them is "defective and missing teeth." It might be convenient to have the dental rejection rates for the various states in the draft of 1918 separated from the remaining forty-three items. Their publication in such form would make ready reference and comparison possible with the data from the present draft when they become available. The rejection rates for "defective and missing teeth" among the men of the draft of 1918 are here assembled, arranged according to the magnitude of the several state rejection rates.

It is recognized that there are probably many factors in the observed differences in magnitude of the rejection rates among the several states. One important variable could be diversity of criteria and degrees of skill among the many examiners.[2, 3] However, these data stem from examinations made at the camps by Army officers. It is suggested that this should tend to greater uniformity than would be expected from examinations made by civilian physicians or dentists of local examining boards.

There were 967,486 men in the sample. The mean rejection rate for the entire group was 24.2 per thousand men examined. Composing this mean value are the rejection rates for the several states.

From the Delamar Institute of Public Health.

The various state rates differ in a striking manner. For example, the rate among the men from Arkansas was only 2.90. Among the men from Vermont, it was 102.85.

These marked differences offer opportunity for unlimited speculation and study regarding the reasons and causes therefor. This is particularly true in the light of the differences noted among the men examined in the two drafts of 1863 and 1864, men of the several northern states[4]; the marked differences in the DMF prevalence rates among school children examined during 1935-1936,[5] and the differences noted during the several excellent surveys by Dean and his associates.[6]

It is suggested that a comparison of the rejection rates among the draftees of 1918 with those of 1940, 1941 and 1942, when they are available, may be instructive and interesting.

REJECTION RATES FOR "DEFECTIVE AND MISSING TEETH" AMONG UNITED STATES DRAFTED MEN OF WORLD WAR (1917-18) ARRANGED ACCORDING TO STATE AND MAGNITUDE OF REJECTION RATE.

| Order of Magnitude | Rejection Rate per Thousand Men Examined | State, Including District of Columbia | Order of Magnitude | Rejection Rate per Thousand Men Examined | State, Including District of Columbia |
|---|---|---|---|---|---|
| 1 | 102.85 | Vermont | 26 | 17.07 | North Carolina |
| 2 | 92.03 | New Hampshire | 27 | 16.58 | Idaho |
| 3 | 79.43 | Maine | 28 | 16.15 | District of Columbia |
| 4 | 79.26 | Rhode Island | 29 | 16.03 | Wisconsin |
| 5 | 78.82 | Massachusetts | 30 | 14.62 | Ohio |
| 6 | 52.38 | New Jersey | 31 | 14.02 | California |
| 7 | 43.13 | New York | 32 | 13.45 | Nevada |
| 8 | 36.52 | Connecticut | 33 | 13.31 | Mississippi |
| 9 | 35.02 | Delaware | 34 | 13.21 | West Virginia |
| 10 | 34.50 | Michigan | 35 | 12.76 | Iowa |
| 11 | 29.08 | Pennsylvania | 36 | 11.04 | Tennessee |
| 12 | 27.38 | Oregon | 37 | 10.24 | Colorado |
| 13 | 23.71 | Louisiana | 38 | 9.47 | Indiana |
| 14 | 23.17 | Montana | 39 | 9.30 | Alabama |
| 15 | 23.03 | Florida | 40 | 9.28 | Wyoming |
| 16 | 22.91 | Washington | 41 | 8.75 | Kentucky |
| 17 | 21.33 | Virginia | 42 | 7.29 | Arizona |
| 18 | 21.28 | Maryland | 43 | 6.95 | Oklahoma |
| 19 | 21.19 | Georgia | 44 | 6.52 | Missouri |
| 20 | 20.91 | South Dakota | 45 | 6.13 | Nebraska |
| 21 | 20.06 | Minnesota | 46 | 5.93 | New Mexico |
| 22 | 19.02 | North Dakota | 47 | 5.91 | Texas |
| 23 | 18.81 | South Carolina | 48 | 3.89 | Kansas |
| 24 | 18.71 | Utah | 49 | 2.90 | Arkansas |
| 25 | 17.48 | Illinois | | | |

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# CONSERVATIVE TREATMENT OF CYSTS

By C. Dudley Gwinn, D.D.S., San Francisco, Calif.

RUSSELL, in 1936,[1] published an article on the treatment of bone cysts of the mandible and maxillae. He applied this treatment only to true bone cysts; i.e., those cysts having no tooth crown or root end as a starting point. His theory is as follows: Cells of the cystic membrane secrete only when under pressure. Relieving this pressure by means of an artificial opening renders the cells unable to secrete. Unable to perform their function, these cells atrophy and disappear. Bone growth takes place beneath the membrane, which now has assumed the characteristics of the normal mucous membrane of the mouth. In time, the cystic cavity is filled with bone and, in many cases, teeth that have been forced out of position by the growth of the cyst return to their normal places.

The series of roentgenograms accompanying his article showed some remarkable bone regeneration following his treatment. Further communication with Dr. Russell resulted in his sending me a number of other roentgenograms of cases that had apparently cleared up completely after treatment. The success of this treatment, as indicated by the roentgenogram, induced me to give it further trial.

## TECHNIC

The technic as described by Russell is mainly as follows:

Anesthesia is a matter of choice for the operator and is determined by the conditions present. The area overlying that part of the cyst nearest the surface of the buccal mucous membrane and most accessible for drainage is selected as the site of the opening. A circular incision is made buccally or labially and a portion of tissue removed three-eighths inch in diameter or wider if the size of the cyst indicates and there is sufficient access. Any buccal bone present is removed to the limits of the incision. The cyst sac is punctured, the contents are evacuated and the cavity is washed with a normal saline or a boric acid solution. The cystic membrane is trimmed away to the limits of the incision. A rubber-dam drain in such shape as to occupy a large part of the cystic cavity and to exert some slight pressure at the opening is placed in the wound. This pressure tends to keep the wound open, an essential point in the treatment. Russell has used mercurochrome in a 15 per cent solution to wipe out the cavity. I use no medicaments. The cavity is washed out and the drain changed every three days. This is continued until the cystic membrane has taken on the characteristics of ordinary tissue, usually about three weeks. Russell recommends leaving the rubber dam drain out after one week. In our cases, use of the drain was continued for about three weeks.

## REPORT OF CASES

Case 1.—A girl, aged 15, first seen in consultation January 20, 1939, had complained for several days of pain in the left mandible that seemed to center in the lower left second bicuspid. Her dentist removed the filling in this tooth and found an

Read at annual meeting of the California State Dental Association, Sacramento, April 14, 1942.

exposed but vital pulp. The pain increased, the buccal tissue became swollen and tender, and the teeth, from the second bicuspid to the central incisor, inclusive, became loosened and quite painful on pressure. X-ray examination revealed the cyst. (Fig. 2.)

January 21, under nitrous oxide oxygen anesthesia, an opening was made below the central and lateral incisors through the labial soft tissue and bone to the cyst cavity. This opening was about three-fourths inch long and three-eighths inch wide. The cyst was opened and the contents were evacuated. No attempt was made to remove the lining. Since the roots of the central and lateral incisors was no tendency for the wound to close. The patient was given a syringe for home treatment and thereafter seen every two weeks for the next three months.

August 18, the lower left second bicuspid was extracted on account of the pulp exposure. It was still vital. The other teeth in the neighborhood of the cyst reacted positively to the electric pulp tester. Figure 3 shows the condition on September 15, about eight months after the operation. To date, there has been no recurrence.

CASE 2.—A man, aged 67, seen November 9, 1937, complained of swelling of the left cheek and gave a history of antrum infection

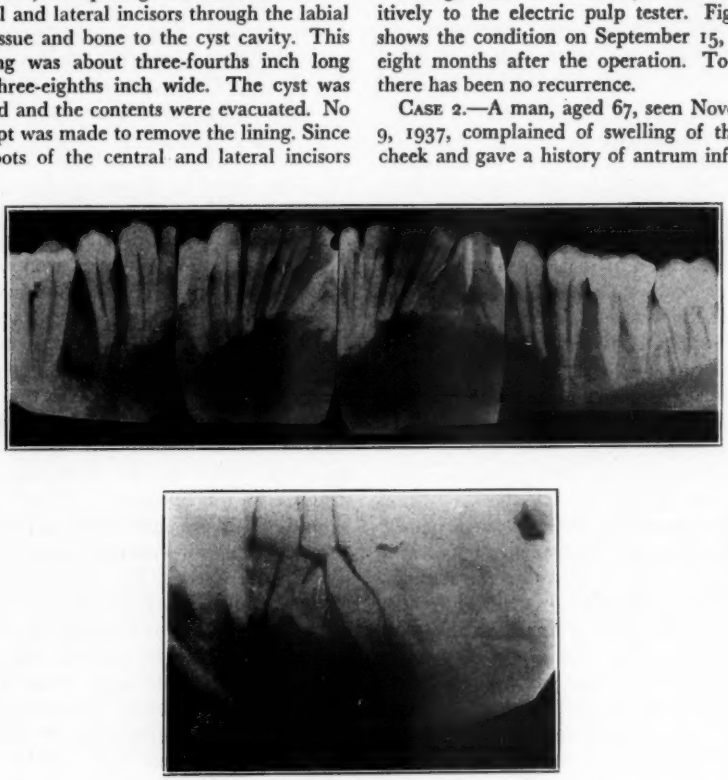

Fig. 1 (Case 1).—Appearance at time of operation.

and first bicuspid apparently extended into the sac, the teeth were extracted. It is possible that these teeth could have been saved. However, it was one of the first cases attempted by this method and I was afraid to leave them in place. A rubber-dam drain was inserted. The wound was irrigated and the drain changed daily for four days and then at intervals of three or four days for about three weeks. At the end of this time, the edges of the wound were healed and there eight years previously, but did not recall which side the infection was on. He had noticed swelling of the left cheek in the region of the canine fossa, which had been present for about six months. There was no pain or tenderness. Four days before I saw him, his dentist had punctured the area from within the mouth and obtained a large quantity of cheeselike material. Two subsequent irrigations had yielded watery pus. Dental films revealed a large cystic area extending

from the left central incisor to the left molar. The roots of the teeth apparently extended into the cystic area.

The teeth were somewhat worn down. The first left bicuspid was missing. The gums and mucous membrane were in fair condition. A small opening in the first bicuspid area had been filled with gauze, removal of which caused drainage of a straw colored fluid. An electric pulp test showed that all teeth except the second bicuspid were vital. There was apparently no air passage from the nose or antrum to the mouth opening. Owing to the age of the patient and the extent of the cyst, it was decided to treat the cyst conservatively. Accordingly, under gas and oxygen anesthesia, the second bicuspid was extracted and the buccal opening enlarged. The remaining contents of the cyst were washed out thoroughly and a rubber-dam drain was placed in the manner previously described. The drain was changed every three or four days for three weeks. At the end of this time, the patient was given a syringe, with which he was able to keep the cavity clean himself. Drainage stopped entirely after one week. The dental films in Figure 3 show the cyst at the time of operation and four years later. The cyst was not responsible for loss of the teeth. There is a depression over the area where the cyst was opened. Healing is apparently complete and the patient is wearing a denture.

CASE 3.—A boy, aged 20, on roentgenographic examination showed a cyst extending between the lower central incisors. The lower right central incisor was discolored and did not respond to the electric pulp tester. There was no pain or soreness to pressure. Under local anesthesia, the pulpless central incisor was extracted. An opening was made labially about one-fourth inch in diameter. The cystic contents were evacuated and the cavity was washed and a rubber drain inserted. This was changed at three-day intervals for two weeks. Drainage stopped after the second change of dressing. Figure 4 shows the condition at the time of operation and about nine months later.

CASE 4.—A man, aged 44, on roentgenographic examination, was found to have a mandibular cyst extending from the right bicuspid to the second molar. The first molar, a devitalized tooth, seemed to be in about the center of the area. This tooth was extracted under local anesthesia and the socket enlarged buccally so that there was

Fig. 2 (Case 1).—Appearance eight months after operation.

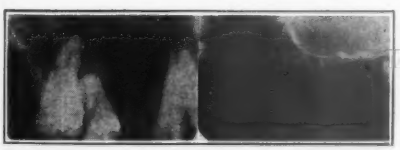

Fig. 3 (Case 2).—Appearance before and after operation.

Fig. 4 (Case 3).—Appearance before and ten months after operation.

an opening into the cystic cavity about one-half inch in diameter. The contents were evacuated and the cavity was washed. The cystic membrane, except where the opening was made, was not disturbed. A rubber-dam was placed and was changed every three or four days for three weeks. Figure 5 shows the condition before operation and Figure 6 three months afterward. At that time, al-

Fig. 5 (Case 4).—Appearance before operation.

Fig. 6 (Case 4).—Appearance three months after operation.

though the bone cavity had not entirely filled in, healing was apparently complete. Attempts to have later roentgenograms taken have failed.

CASE 5.—A boy, aged 17, seen September 6, 1940, had a slight swelling of the left mandible in the first molar region, with no pain or soreness. The roentgenogram in Figure 7 shows a cystic area extending from the first bicuspid to the second molar. These teeth responded to the electric pulp test and were of a good color. Under local anesthesia, an opening about half inch in diameter was made buccally opposite the second bicuspid and first molar. There was a pronounced bulging of the buccal plate, which was paper

Fig. 7 (Case 5).—Appearance at time of operation.

Fig. 8 (Case 5).—Appearance six months after operation.

thin. The membrane lining the cystic cavity was very thin. The cavity was filled with a thin straw-colored fluid. After the contents were evacuated, the roots of the first molar and the root of the second bicuspid could be plainly seen as far as their apices. Immediate extraction of these two teeth seemed to be indicated. It was decided, however, to

follow the proceeding originally decided upon, and accordingly a rubber-dam drain was placed. This was changed every three days for three weeks.

Figure 8 shows the condition of the bone after about four months. The bone had filled in. The teeth still react to the electric pulp tester.

## CONCLUSION

In our series of cases, including the ones reported here, there has been complete disappearance of the cystic area. In several cases, the bone redeposited has not been so heavy nor so regular in formation as the other bone in the jaws. The remaining teeth are still vital. This method must be regarded as an adaptation of the Partsch method. It differs only in the size of the opening made. This necessitates the insertion of the rubber-dam drain.

Kazanjian[2] has used this method and believes it applicable in certain types of cases. From the results that I have obtained thus far, I believe that there is a definite place for this method. In children and even in adults in whom complete removal of the cystic membrane would make the extraction of several teeth necessary, Russell's method possesses distinct advantages. If the cyst can be reduced, it may be possible to save teeth that would otherwise be lost. There is no reason why a radical operation cannot be performed if the cyst has not entirely disappeared after a reasonable length of time. It will be noted that the cases reported in this paper are mostly radicular cysts. Only one, Case 5, might come under Russell's description of a "true bone cyst." It would seem that in applying this method to radicular cysts, extraction of the devitalized tooth about which the cyst has formed is indicated.

## SUMMARY

1. The conservative treatment of cysts suggested by Russell has been given further study, the treatment being extended to radicular cysts.

2. The results, although the number of cases is small, have been satisfactory.

3. When radicular cysts are treated, the extraction of the devitalized tooth or teeth from which it is suspected that the cyst originated is recommended.

4. The simple method of treatment presented may be the means of saving vital teeth otherwise doomed to extraction.

5. This method can be used in the treatment of simple bone cysts and radicular cysts.

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THE JOURNAL *of the*
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SEPTEMBER 1 — *Editorial Department* — 1942

# THE DENTAL HYGIENIST IN DENTAL PRACTICE

FROM the time of the recognition of the importance of the systemic relation of mouth disease and the subsequent recognition of the health obligation of dentistry from the biologic aspect, the cardinal principle of medicine—prevention—has been uppermost in the minds of the members of the dental profession. And in the efforts to apply this principle to the control of our most difficult problem—dental caries—the desirability of establishing and maintaining healthy hygienic conditions in the oral cavity has occupied the attention of the dental profession. As a result, the question of cleanliness and hygienic care of the mouth and teeth has been cultivated to the *nth* degree and numerous toothbrushing methods and numerous methods for the care of the teeth and mouth have been devised and promoted, all with the purpose of scrupulous care of the mouth and teeth directed toward prevention of dental diseases.

All of these measures and methods, we believe, possess elements of virtue, and while there seems to be doubt in the minds of some as to the preventive qualities of any method of toothbrushing, there is no doubt

in any one's mind as to the benefits of the prophylactic care of the mouth and teeth as an ancillary aid to the operative efforts of the dentist in repairing and controlling the ravages of caries.

The emphasis which the efforts at cleanliness placed upon oral hygiene eventuated in the development of the dental hygienist as helpful toward prevention, if not prevention in its true sense, and many of the members of the profession have availed themselves of this valuable adjunct to dental practice.

There are now some thirty-five states in which the dental hygienist is legalized and licensed to practice under the direction, control and responsibility of the dentist; and there are other states now considering such legalization and licensure. The most recent example, we believe, is that of Illinois, in which state, serious study, investigation and survey have been made with a view to determining whether Illinois shall avail herself of the benefits to be derived from this adjunct to practice.

A brief historical survey of the hygienist movement indicates that the first hygienist law was adopted in 1907, and legalization has gradually spread from one state to another until now thirty-five states have opened their doors to the hygienist. In practically all states, the dental hygienist is under the direct supervision of the dentist, and the dentist is legally responsible for keeping the activities of the hygienist within legal limits.

From the origination of the movement, the principal and practically the only objection ever raised to the hygienist has been that she might step over into the field of the dentist, but time has proved that this anxiety is without justification. We have been familiar with the development of the agency from its very origin and we have yet to know of but a single instance where the hygienist has infringed the dental law. On the other hand, the high ethical spirit of the originator of the movement, Dr. Alfred C. Fones, as well as of those associated with him in launching the project, has been so instilled into these professionally minded women that they have, on the whole, been a credit to dentistry, not only in the efficiency of their work, but in their valuable aid to the dentist.

With regard to the approval accorded the hygienist by the profession, while the American Dental Association has not officially approved the project, it has not disapproved it, and we would make it clear that the views expressed here regarding the hygienist movement are the personal views of the Editor and do not represent any expression of the official attitude of or approval by the Association proper.

Because we have been so favorably impressed by the service rendered

by the hygienist, we feel that the dentist who is not employing a hygienist is failing to avail himself of a mouth health service that will enable him to greatly enlarge his clientele and much enhance the benefits of his service. The dentist can readily care for more than twice as many patients during the year if they receive prophylactic care from the hygienist supplementary to the operative care of the dentist. The care which the patient receives from the hygienist is such that the necessity for actual restorative dental service is materially lessened, and the absence of pain and discomfort from the ministration of the hygienist makes the prophylactic service a pleasure in anticipation and realization.

In a time when it is quite probable that the resources of the profession will be severely taxed because of the demands from the Army and the industrial world, it behooves the profession to utilize every available agency that can offer additional aid to the profession in caring for the public.

True, the demands upon the dental profession have not yet become serious, but with the prospect of a long and tedious war, we are apt to find ourselves in a similar dilemma to that in which the medical profession finds itself today.

Only recently, the chairman of the Committee on Legislation of the American Dental Association, in an effort to ascertain the general attitude of the dentist toward licensing the hygienist, and to learn from those who employ hygienists whether their service and function are satisfactory, sent out a questionnaire to the secretaries of a number of state societies. Dr. Patterson summarizes the result of the questionnaire as follows:

"The replies showed a unanimous satisfaction with the hygienist laws now in effect and the manner in which the dental hygienist has proved her value to both the profession and the public. Much to my surprise, we did not receive a single criticism or an objection to their recognition; and in only one instance—and that a very minor one in California—has an infringement or a violation of the dental laws that control the hygienist been reported."

It must not be understood that all the service of the hygienist comes through the private practice: one of the most beneficial expressions of her work is in the schools, and we do not believe anyone who has seen the actual results of the hygienist's service in the public schools and in institutional clinics will deny the great benefits to be derived from the service, both from its general health value and from its value as an educational stimulus toward proper care of the mouth and teeth.

In the most conspicuous example of the benefits to the school child—the Bridgeport demonstration by Dr. Fones and his group of dental hygienists—it was distinctly proved that mouth hygiene is the most practical method of prevention of dental disease yet within the means of the dental operator, and, on that basis, it should be prosecuted to the fullest extent until better and more efficient means are made available.

Another phase of dental practice in which the hygienist can and does render an invaluable service to the patient and to dentistry is in her educational talks to patients which her contacts afford. It is well agreed that the most effective dental education to the public is rendered at the dental chair, and the teaching of mouth hygiene which the hygienist supplements by demonstration is such that patients are eager and willing to continue the service, not alone because of a realization of its health value, but also because of the refreshing sense of cleanliness created by the intelligently executed prophylatic treatment.

Again, we would emphasize the fact that the views expressed here are purely those of the Editor, formed from a long and close observation of a service that can mean much as an economic factor in dentistry, which today is considered inordinately expensive by the public generally.

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# BIBLIOGRAPHICAL

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### A Textbook of Bacteriology

By THURMAN B. RICE, A.M., M.D., professor of bacteriology and public health at the Indiana University School of Medicine. Ed. 3, revised. 560 pages; 118 illustrations. Price $5. Philadelphia: W. B. Saunders Co., 1942.

THE subject of bacteriology has become so large and unwieldy that a beginning student or general practitioner in medicine, dentistry or pharmacy can easily become lost in a maze of detail. The "Textbook of Bacteriology" by Thurman B. Rice has been prepared to serve as a practical guide to the general subject of bacteriology, and the material presented is limited to the fundamental phases of the field which are generally accepted.

This book is not intended to be a reference work or a manual for determination of the identity of species. It will serve as a basis for the understanding of disease, so that diagnosis, prognosis, treatment and general management may be as efficient as possible. The subject matter is carefully condensed with all nonessential details deleted. No bibliographic references are included, as the author believes these should be given in lectures.

The book is well illustrated with schematic pen and ink drawings depicting technics to be used and the diagrammatic appearance of various species of bacteria in smears from patients and in pure culture.

Several pages are devoted to oral bacteriology, including that of the normal oral

flora, and the bacteriology of dental caries and Vincent's infection. These discussions are not exhaustive, but serve as a suitable introduction to these subjects.

The book is intelligently organized and clearly written and should continue to be a popular bacteriology textbook.

## The Physical Properties of Dental Materials. Circular 433, United States Department of Commerce, National Bureau of Standards

By WILMER SOUDER and GEORGE C. PAFFENBARGER. 222 pages. 1942. For sale by the Superintendent of Documents, Washington, D. C. Price 75 cents.

THIS book is a compilation of the work done at the National Bureau of Standards since 1928 by the American Dental Association Research Associates and the workers in the Dental Division of the National Bureau of Standards. During these years, the Research Commission of the American Dental Association has maintained fellowships at the National Bureau of Standards, the many publications of which have appeared from time to time both in the dental literature and in Government publications. These publications are undoubtedly familiar to every dentist in America, and throughout the world, as the culmination of work that can be relied upon. The dental profession is fortunate in having this connection.

In this compilation, the authors have successfully attempted to satisfy both the laboratory scientist and the dentist. The style is very readable, with observations both practical and accurate. The authors are to be congratulated on being able to present many pages of scientific data with interpretations appealing to the practical man.

We who do research in this field are particularly pleased with the implications of the authors here and there throughout the book. In previous publications, the implications of the data have sometimes been few and far between, and the reader has been left to draw his own conclusions in this regard. Even the data seem to take on new life in this environment, and one reads the book with great satisfaction, inasmuch as many of the scientific papers concerned with the various materials investigated have been brought together and each material handled individually.

The following dental materials are discussed: dental amalgam alloy, dental mercury, gold alloy, base metal alloys, investments, cements, impression materials, inlay waxes, denture base materials and dentifrices. The book is concluded with certain Government information, and the Federal and American Dental Association specifications have been printed for the first time within one cover.

This book should assuredly be in the possession of every dentist, dental teacher and student in the United States, and throughout the world for that matter. The work will undoubtedly be one of the classics of dental literature.

E. W. SKINNER.

## Textbook of Pathology

ROBERT MUIR, M.A., M.D., Sc.D., LL.D., F.R.S., emeritus professor of pathology, University of Glasgow, honorary pathologist to the Western Infirmary, Glasgow. Ed. 5. 991 pages; 599 illustrations. Price $10. Baltimore: The Williams and Wilkins Company, 1941.

THE new (fifth) edition of Sir Robert Muir's "Textbook of Pathology" is quite similar to the previous popular editions, except that the author has added many of the recent developments in the various branches of pathology. He has avoided discussions of rare pathologic conditions, concentrating upon broad general principles. As a result, this book is a textbook for undergraduate students in pathology rather than a reference book.

The subject matter is presented in a logical manner, according to "systems." The author discusses disturbances of the circulatory system, respiratory system, alimentary system, nervous system, etc. Those sections of the book dealing with general pathologic principles are exceptionally well done. The author has refrained from devoting much space to controversial subjects. No mention of dental caries, periodontitis or other phases of oral disease could be found.

As might be expected, the English system of spelling is used for such words as leukemia, tumors, edema, etc. The illustrations

seem adequate, but too few bibliographic references are given.

The book is clearly and logically written and can be recommended as an introductory text in general pathology for undergraduate students.

## Internal Medicine in Dental Practice

By BERNARD I. COMROE, A.B., M.D., F.A.C.P., Associate in Medicine in the School of Medicine and Dentistry of the University of Pennsylvania; LEON H. COLLINS, JR., A.B., M.D., F.A.C.P., Associate in Medicine in the School of Medicine; Instructor in Medicine in the School of Dentistry, University of Pennsylvania, and MARTIN P. CRANE, B.S., M.D., Instructor in Medicine in the Schools of Medicine and Dentistry of the University of Pennsylvania. Second edition, enlarged and thoroughly revised. 1942. Octavo, 543 pages, illustrated with 76 engravings and 6 colored plates. Cloth, $5.50, net.

THE second edition of this popular book contains approximately 100 additional pages and many new engravings. All sections have been thoroughly revised. The new chapters on focal infection, the sulfonamides, gramicidin and penicillin are complete and well presented. The authors' viewpoint on focal infection is both conservative and cautious. Summaries in box form of most of the important diseases afford the busy practitioner a quick reference source. The authors have well achieved their stated purpose of giving the dentist a "speaking knowledge" of modern internal medicine.

There is considerable variation in the completeness of the various sections, but this is unavoidable in a joint author publication. The chapters on diseases of the blood and the endocrines are excellent. Those concerned with the heart, bones and joints might be shortened without detracting from the value of the book. Much more preparation and space might have been devoted to the deficiency diseases and the vitamins in view of their importance in internal medicine and dentistry.

An extensive bibliography follows the presentation of each disease. The references are authoritative and up-to-date. The illustrations are well selected and well reproduced. More consideration might have been given to the indexing.

The reviewer can recommend this book as the best source of ready information concerning the relation of internal medicine to dental practice. Every practitioner should have this book and be familiar with its contents.

LESTER W. BURKET.

## Manual of Standard Practice of Plastic and Maxillofacial Surgery

Prepared and edited by the Subcommittee on Plastic and Maxillofacial Surgery of the Committee on Surgery of the Division of Medical Sciences of the National Research Council and representatives of the Medical Department, U. S. Army, ROBERT H. IVY, Chairman. Cloth. 432 pages; 259 illustrations. Price $4.50. 1942. Philadelphia: W. B. Saunders Co.

THIS is the first of a series of military surgical manuals to be prepared, covering the surgical specialties, with particular emphasis on war injuries. This volume has a group of eminent contributors and the contents can be accepted as authoritative. The first half of the book is devoted to general considerations of the head and neck in plastic and reconstructive surgery and contains separate chapters devoted to each of the anatomic regions under discussion. To this end, a series of approved procedures are detailed and described in outline, with adequate illustrations and drawings to clarify the problems. Sections are thus devoted to reconstructive procedures on the eyelids, nose, lips, ears, cheek and neck. It is refreshing to see certain of the older plastic procedures reproduced to be heartily condemned, and more logical anatomic and physiologic solutions substituted. The second half of the book is devoted to maxillary surgery, and this section will prove to be of the greatest interest to dentists. A short discussion of the immediate care of gunshot wounds of the jaws is given, followed by a detailed description of the treatment of fractured jaws. In this section, certain new and simplified procedures are described which are certain to find favor in civilian as well as in military surgery. The use of the Roger Anderson apparatus for fixation of cer-

tain mandibular fractures is briefly discussed. There is a complete section on the use of splints in the treatment of fractures, together with a chapter on maxillary prostheses for the correction of certain inoperable defects. The volume closes with a short chapter on local and general anesthesia, in particular reference to head and neck surgery. This volume is a handbook in the complete sense of the word. It is clearly and succinctly written and is beautifully illustrated, setting a high standard of excellence for other military manuals in this series. The editors deserve the congratulations and thanks of the dental and medical professions.

F. F. K.

## Solving School Health Problems

By DOROTHY B. NYSWANDER, Ph.D. Commonwealth Fund, New York, 1942. Price $2.

FOR years, there has been a growing feeling of dissatisfaction on the part of health workers and educators regarding school health programs. "Practice," say the critics, "does not match up with theory. Staffs continue to do the same kind of job they did twenty years ago."

Determined to do something about it, a study of the Astoria, New York Health District was started in 1936 by a committee sponsored by the Department of Health and Board of Education of New York City. Aided by the American Child Health Association, the Milbank Memorial Fund, the Metropolitan Life Insurance Co., the United States Children's Bureau and the New York State Department of Health, the study was made to determine the most satisfactory method of providing health service to school children.

The study, during the four years of its existence, passed through three distinct phases, the first of which was to make an analysis of the Astoria school health problem. The second phase was devoted to experimenting with methods of solving the difficulties, and the third stage consisted of making its field laboratory into a teaching center for the benefit of others throughout the New York school system.

Miss Nyswander, director of the study and her study staff, with the aid of a competent advisory committee, ably presents a picture of their four years' work in sixteen chapters and 375 pages. The report contains a number of specific recommendations for the improvement of school health work. These include three basic recommendations which will undoubtedly apply in every community in the country: 1. Increase in budgetary appropriations, making possible a larger health staff. 2. An extension of the service to other schools in the city. 3. Specific research into better case-finding methods and into the relative values of public health procedures now in common use.

Every community can profit from the Astoria study and every health worker, physician, dentist, nurse, teacher and hygienist will find much of value in the committee's clear description of it.

L. W. M.

## A Textbook of Histology

By ALEXANDER A. MAXIMOW, late professor of anatomy, University of Chicago, and WILLIAM BLOOM, professor of anatomy, University of Chicago. Ed. 4, completely revised, with 562 illustrations, some in colors. 695 pages. Price $7. Philadelphia: W. B. Saunders Co., 1942.

IT is a pleasure to note that a new and revised edition of Maximow and Bloom's excellent textbook of histology has been published. For years, this book has been one of the best and most popular books on general histology, and this new edition will win many new friends. The subject is presented in sufficient detail for the book to serve as a reference work, as well as a textbook, providing students with an adequate description of the minute structure of the human body. As in previous editions, a general description of topics is presented in large type, and details are included in small type. Labels on many of the complex illustrations have been spelled out, making them much easier to understand.

Marked revisions have been made in the introduction and in those sections of the book dealing with bone, nerves, spleen, female generative system and the eye. Many references to current literature have been added to each chapter. Thirty-five pages are devoted to the histology of the oral structures.

The book can be highly recommended to every serious student of general histology.

### First Aid Primer

By HERMANN LESLIE WENGER, M.D., and ELEANORA SENSE, B.Sc., M.Sc., New York: M. Barrows & Co. Price $1.

THE United States is confronted with total war. Our best defense is total preparedness. It is the duty of every citizen to be prepared to handle any war emergencies with which he is confronted. The "First Aid Primer" will materially help in that preparation.

Its 104 pages and thirty-nine illustrations explain in simple language many of the fundamentals of handling emergencies. It should prove very useful to the air raid warden, teacher, first aid student nurse and others interested in maintaining morale.

The first nine chapters contain simple instructions in first aid, handling of supplies, dressings, bandages, antiseptics, control of bleeding, artificial respiration, infections, incendiary bombs, poison gas, splints, the handling of broken bone cases and the transportation of the injured.

The final five chapters deal with family health under wartime conditions, such as health aids, emergency feeding, blackout instruction and nutrition for the defense worker and his family. While the "First Aid Primer" does not profess to be a complete treatise on war emergencies, it does present a fund of essential information in a manner that will prove helpful to all.

L. W. M.

BOOKS RECEIVED

### A New Approach to Old Diseases. A Description of the Source of Many Diseases

By OTTO MEYER, M.D. 1942. New York: Savoy Publishing Co. Price $2.

### Proceedings of the National Nutrition Conference for Defense, May 26, 27 and 28, 1941, called by President Franklin D. Roosevelt

Federal Security Agency, Office of the Director of Defense, Health and Welfare Services, Washington, D. C. United States Government Printing Office, Washington, D. C., 1942. For sale by the Superintendent of Documents, Washington, D. C., Price 35 cents.

### Technical Manual for Dental Technicians

Published by War Department, Washington, January 28, 1942. For sale by Superintendent of Documents, Washington, D. C. Price 40 cents.

### Manual on Dental Care and Dental Internships in Hospitals

Published by American Hospital Association, Chicago, Ill. 1941. Price, paper, 50 cents; cloth, $1.

### Food Values in Shares and Weights

By CLARA MAE TAYLOR, Ph.D., Assistant Professor of Nutrition, Teachers College, Columbia University. New York: The Macmillan Company. 1942. Price $1.50.

### Vitamins and Minerals for Everyone

By ALIDA FRANCES PATTEE; DR. HAZEL E. MUNSELL, Technical Advisor. New York: G. P. Putnam's Sons. 1942. Price $2.

### ". . . But Collections Are Awful"

By ROBERT FOSTER ASH, Author of "Many Happy Returns." Privately printed at Binghamton, N. Y.

### Handbook of Scientific and Technical Societies and Institutions of the United States and Canada

BULLETIN of the National Research Council, Number 106, January 1942. Fourth Edition. United States Section. Compiled for the National Council of the United States by Callie Hull and Mildred Paddock. Canadian Section Compiled for the National Research Council of Canada by S. J. Cook and P. A. Howard. Published by the National Research Council, National Academy of Sciences, Washington, D. C.

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# DENTAL PREPAREDNESS COMMITTEE

## DENTISTS IN CIVILIAN DEFENSE

THE Committee on Dental Preparedness emphasizes again the necessity for *all* dentists not otherwise engaged in war effort to participate in civilian defense. Copies of Bulletin No. 1, "The Dentist in Civilian Defense," are still available from the Central Office. The following is a copy of the committee's release sent to State Military Affairs Committees *et al.*, supplementing the bulletin:

To: *State Military Affairs Committees, Officers and Board of Trustees, American Dental Association, Presidents and Secretaries of State Dental Associations, Deans of Schools of Dentistry, Secretaries of Component Societies.*

CIVILIAN DEFENSE

To assist in the attaining of objectives desired under Bulletin No. 1, "The Dentist in Civilian Defense," the Committee on Dental Preparedness transmits herewith:

(1) Bulletin just issued by the Medical Division, U. S. Office of Civilian Defense, entitled "Treatment of Burns and Prevention of Wound Infections." Additional copies can be obtained from local councils of civilian defense.

(2) The following description by Otto W. Brandhorst, secretary, of the courses in military dentistry successfully presented by the St. Louis Dental Society:

MILITARY DENTISTRY

February 4: L. T. Byars, Washington University; "Time Element in Treatment of War Injuries of Face and Mouth."

February 5: Frank J. Tainter, St. Louis University; "Gunshot Wounds of the Jaws."

February 11: Robert Mueller, Washington University; "The Maxillofacial Teams—The Duty of the Dentist on the Front Line."

Feburay 12: Curtis H. Lohr, St. Louis University; "Tracheotomy: Indications and Technic."

February 18: James A. Brown, Washington University; "Construction of Splints."

February 19: Charles F. Sherwin, St. Louis University; "First Aid for Jaw Casualties."

February 25: Louis Jorstad, Washington University; "Emergency Treatment for Jaw Casualties."

February 26: Thomas C. Wimber, St. Louis University; "The Dentist and the Emergency of Military and Civilian Defense."

March 4: Robert Mueller, Washington University; "Gunshot Casualties and Shock."

March 4: Edwin C. Ernst, Washington University; "X-Ray Studies and Diagnosis of Injuries of the Face and Jaws."

March 5: J. Walter Ford, St. Louis University; "Dental Considerations of Jaw Casualties."

March 11: J. Barrett Brown, Washington University; "Fractures of Maxilla and Mandible."

March 12: Justin M. Grimm, St. Louis University; "Sectional Splints."

March 18: Mrs. E. Lee Shrader and Miss Helen McLachlen, Washington University; "Dietary Management in Treatment of Maxillofacial Cases."

March 19: Charles F. Sherwin, St. Louis University; "The Surgical Considerations of Jaw Casualties."

March 25: Clement J. Gaynor, Washington University; "The Regimental Dental Officer."

March 25: William B. Spotts, Washington University; "The Approach to the Operating Room."

March 26: "Frank J. Tainter, St. Louis University; "Gunshot Wounds of the Face; Plastic Reconstruction of Face and Jaw Following War Injuries."

April 1: J. Barrett Brown, Washington University; "Jaw Wounds and Infected Bone."

April 1: James A. Brown, Washington University; Clinic on splints.

April 2: Thomas C. Wimber, St. Louis University; "Chemotheraphy and Gunshot Wounds."

April 2: J. Walter Ford, St. Louis University; Clinic on fractures.

April 8: Louis H. Jorstad, Washington University; "Trismus and Its Treatment."

April 8: H. B. G. Robinson, Washington University; "Some Pathologic Conditions of the Oral Cavity Which Should Not Be Overlooked."

April 9: Allen McNearney, St. Louis University; "General Anesthesia."

April 9: Justin M. Grimm, St. Louis University; Clinic on fractures.

April 13: Dinner in honor of the essayists, Congress Hotel.

(Registration of 101 practitioners and 113 students.)

In these lectures, we found many suggestions for a course in anesthesia. It was felt that the dentist, in many instances, would be called to act as the anesthetist. With this idea and also with the thought that acquaintance with hospital routine would be a distinct advantage, arrangements were made with several institutions for weekly demonstrations at stated times. These demonstrations were usually limited to four dentists to enable the group to be in the operating room during the operation. We hope to enlarge upon the anesthesia aspect of this arrangement during the summer or fall. The following institutions cooperated and fifty-five of the practitioners were scheduled to visit each one of the institutions at stated times:

(April 15 to June 1)

Barnard Skin and Cancer Hospital
Barnes Hospital
St. Louis City Hospital
St. Louis County Hospital
Municipal Dental Clinic
St. Louis University Dental Clinic
Washington University Dental Clinic

Out of the series of lectures, there also developed a desire for more knowledge of the anatomy of the head and neck, and this course was arranged to cover a period of six weeks, with two evenings each week. The first hour of each session was devoted to a lecture, then two to three hours of dissection followed. The lectures were open to all of the members of the study club classes. The dissection period was limited to thirty men and five tables of cadaver material was arranged for, with six men to each table. We were fortunate in securing the professor of anatomy at Washington University School of Dentistry for this course. The original charge for the course was $5 to the practicing dentist and $2 to the dental student. However, we found it necessary to make an additional charge for those taking the actual dissection.

Besides the provision of a wealth of information on the subject of military dentistry, a great deal of good will and cooperation was developed between the medical and dental professions through these activities.

The committee desires to emphasize its realization that a comprehensive program of this character is not possible in all communities, and it recommends that, when necessary, modified programs be formulated. Dr. Baehr has requested that dentistry work in close cooperation with the local emergency medical service and the medical society.

Too much credit cannot be given

Missouri, Michigan, New York, Wisconsin and other states which have so wholeheartedly given this matter of civilian defense the consideration it deserves.

The committee believes that the program of civilian defense is the answer to the many inquiries by dentists who desire to know what they may do in the emergency when ineligible for active war service. Modern war brings civilian defense to the front. Oftentimes it becomes the equivalent to the front line, and the dentist who is prepared to take his proper place strengthens the defense of his country, protects his family and neighbors and brings credit upon his profession and himself. Above all, it gives him an opportunity to save life.

Your country calls! Need we say more?

C. WILLARD CAMALIER, *Chairman*
G. D. TIMMONS, *Secretary*
GEORGE M. ANDERSON
H. C. JARVIS
H. O. LINEBERGER
P. C. LOWERY
J. T. O'ROURKE
C. E. PETERSON
L. M. WAUGH
Dental Preparedness Committee

# BUREAU OF PUBLIC RELATIONS

## THE RÔLE OF DENTISTRY FOR CHILDREN IN A NATIONAL HEALTH PROGRAM

By HAROLD W. OPPICE, D.D.S., Chicago, Ill.

There are two great fronts in the preservation of health and treatment of disease, whether we speak of adult or child. On the one front, general measures are applied to prevent well people from becoming ill; on the other, patients are treated to restore them to health and to limit the spread of disease. On both fronts, organization and administration are needed, as well as technical knowledge. . . . Otherwise, knowledge is sterile; and we already know more than we actually put to use.—*Proceedings of the White House Conference on Children in a Democracy, 1940.*

IT is on the first great front—the prevention of disease—that dentistry for children can make its most effective attack in the unending battle against the scourge of dental disease. It is in the prevention of disease that the highest duties of the dentist as a professional man are manifest. Dentistry for children is of unique importance in this regard because all of its objectives and all of its technics are directed toward the prevention of dental disease. In fact, it has become almost axiomatic in dentistry that preventive dentistry is dentistry for children.

There is no great need to sketch in the background of such an obvious truth for an audience in a section devoted to children's dentistry. Yet it might be helpful to present some of the individual conditions that lead toward this final conclusion.

### THE CAUSES OF CARIES AND ITS PREVENTION IN CHILDREN

The causes of the greatest of all diseases—dental caries—are not known. Until these causes are scientifically established through increasing dental

Read before the Section on Children's Dentistry and Oral Hygiene at the Eighty-Third Annual Meeting of the American Dental Association, Houston, Texas, October 28, 1941.

research, the most effective means of preventing the disease cannot be determined. Until these causes are known, prevention must be handicapped because it must disperse its forces in a variety of directions: oral hygiene, diet, water supply, the mineral and vitamin elements of food, endocrine metabolism, regulation of oral flora and the maintenance of sound general health. All of these contribute more or less directly to dental health. If one of these conditions or any definite combination of them could be isolated as the specific cause of dental caries, the task of prevention would be immeasurably lightened, because every dental resource could then be marshalled on this single front.

In the absence of this knowledge, dental prevention must go forward as best it can. Since dental disease is cumulative in its effects, it follows that the campaign of prevention must be started early in life—during childhood. Thus, dentistry for children becomes the first weapon of importance against dental diseases and, therefore, it must be the basis of any program that attempts to eradicate dental disease on a national scale.

### PREVENTION IN OLDER AGE GROUPS

There are other reasons why dentistry for children constitutes the soundest and most basic approach to the problem of preventing dental disease in the adult group. If dental defects are allowed to accumulate during childhood, destruction of the masticatory apparatus will have reached an almost irremediable level by the time adult life is attained. In addition, the cost of treating accumulated dental disease in adults on a national scale is so huge that no adequate and complete program, even if financed by the government, can withstand the financial impact. Dentistry for adults in a program calculated to reduce the ravages of dental disease on a national scale is uneconomic, unscientific and financially unsupportable. We return, therefore, to the starting point, that intensive and expanded programs of dentistry for children constitute the only sound basis of approach to the problem of dental disease on a national scale.

### RESPONSIBILITY FOR PREVENTION

It becomes important, at this point, to establish the agency upon which the responsibility for this prevention falls. Ideally, of course, in a democratic society, it falls upon the individual and his family. More Americans discharge this responsibility at the present time than ever before, but there are still large segments of the population which are unable, or unwilling, to provide the needed care on their own initiative and out of their own resources.

When the obligation of the family, for whatever reason, is not met, it is transferred to a collection of families that we know as the community. It is at this level, perhaps, that the most effective programs of prevention can be devised, when the responsibility is properly assumed. The community has the best knowledge of its own needs and of the methods that it wishes to use to meet them. Funds can be made available by the entire community through its government, or through civic, fraternal, welfare and other volunteer agencies. The school system, an organized mechanism available in every community, lends itself well to the development of a dental health program.

It cannot be emphasized too strongly that the community provides the most satisfactory, the most efficient and the most desirable level at which to establish a program for dental health.

In the event that the community cannot, or does not, discharge its responsibility as to dental health, the state, as a collection of communities, is the next

agency upon which this responsibility rests. Almost all of the states have recognized this responsibility at the present time, but not to the same extent that they have recognized their responsibility to the mentally ill, to those suffering from tuberculosis or cancer, to the crippled and the blind. Increased recognition by the state of its responsibility for dental health is the next step that must be taken.

Such a recognition of responsibility by the state does not imply that the rights of the community and of the individual in this regard are to be eliminated. Rather it implies that the state will aid the community in supplying needed facilities and resources, thus maintaining the local determination of need and the local administration to that need.

If the state does not, or cannot, discharge its responsibility for health, the responsibility passes to the federal government, which is nothing more than the collection of the states. This responsibility is subject to somewhat the same limitations as is that of the state. The federal government should limit its aid to those functions that the individual state cannot discharge by itself and to the provisions of funds that will enable the state to discharge its responsibility through a program of its own devising.

Such a federal program is already in effect under the Social Security Act of 1935. Under two titles of this act, the federal government can give grants-in-aid to the states for certain purposes. The state, in turn, must appropriate an equal amount of its own money for the same purposes. Only a small portion of funds granted under the Social Security Act are applicable to the dental needs of the population. The Children's Bureau of the United States Department of Labor has undertaken the largest dental program to date, but even that is greatly limited. The United States Public Health Service, under provisions of the Social Security Act, plays only a minor rôle in dental health, as its aid is limited to acting in a consultative capacity to the states and in the training of personnel. From the standpoint of an effective attack against dental disease on a national scale, it seems to be both obvious and imperative that a larger share of funds under the present titles of the Social Security Act be made available for dental purposes. It may also be concluded that the federal government has not borne its proper share of responsibility for national dental health, and if confirmation of that opinion is needed, the result of dental examinations under the Selective Service and Training Act of 1940 should be sufficient.

In all of this discussion of responsibility, there has been no mention of the dentist, either individually or collectively, because the discussion has been on the financial responsibility for dental health programs. This is not an obligation of the dentist except as he shares it with all of the other members of his community.

It is true, of course, that, in many, many instances, the dentist, either through individual efforts or those of his dental society, has supported financially a majority of the programs for dental health. As willingly and as enthusiastically as dentists have done this in the past, a simple fact must be recognized: Unless these efforts are greatly implemented by other agencies that have direct responsibilities for dental health, a national attack upon dental disease must remain inactive, on the blueprints of the planning table.

In what directions, then, do the responsibilities of the dentist as a professional man extend? The dentist, individually and collectively through organized dental societies, must provide the leadership that is essential to the development

of a dental health program. In addition, the dentist must provide the technical knowledge for carrying such programs to a successful conclusion through service of a high quality.

It is not enough, at the present time, to apply all of the old rules and principles of dentistry for children to increased dental participation in a national health program. These rules and principles should be scrutinized and, if necessary, reinterpreted, in the interests of a more dynamic leadership in a program for dental health on a national scale. Dentistry for children as a specialized branch of our profession is one of the more recent developments. It is undoubtedly one of the most important. Its importance will increase if it will keep its technics fluid so that they can be changed easily to meet new needs; if it will take from the other, associated sciences those products that it can bend to its own peculiar needs.

In order for dentistry for children to take its place in a sound national program for dental health, the practitioners of the specialty must turn their attention to three important problems:

1. The concept of the child should be altered for many of those who practice dentistry to include the best scientific principles dealing not only with dental development, but with psychologic and biologic development as well.

2. The child should be given dental treatment with a better understanding of his needs in other departments of physical health and welfare.

3. A more intensive study of dental technics should be initiated with the particular view of adapting them more closely and more efficiently to the needs of the child.

In view of the importance of these three points, it may be well to consider them in brief detail.

### THE CONCEPT OF THE CHILD

To many dentists who treat children, the child is only an immature adult who presents needlessly difficult problems of management; a reluctant patient who presents an almost endless series of carious, erupting, decalcifying, malposed and unbrushed teeth; an unprofitable patient whose parents desire service on the same basis as cut-rate transportation for children.

When considered as a group, the child too often is regarded as nothing more than the subject of an enormously large number of dental operations, a fact which is used in annual reports to impress those sponsoring the project. Too often is the success of a dental health program evaluated upon the mathematical number of operations that have been performed on child patients, or the number of first permanent molars saved from the ravages of dental caries. There has also been a notable tendency to consider the dental health of a child merely during his elementary school years. Prior to and after this period, he was left to his family's or his own devices, and these had anything but a salutary effect on dental health.

Such concepts of the child are not desirable and, what is more, are not accurate. The child's condition must not be considered as the mere background of future dental operations. Rather, dental operations must be employed in order to provide the child with a certain level of dental health so that he may take his place, unhampered, at the station for which his training and environment have fitted him. This is the social viewpoint as contrasted to the definite limitations of the purely dental viewpoint.

One of the greatest of modern child psychologists, Arnold Gesell, sees childhood as an extended period of growth in which there are many influences con-

stantly active to produce the conditions of maturity. He says,

> In a biological sense, the span of human infancy extends from the zero hour of birth to the middle twenties. It takes time to grow. It takes about twenty-four years for an American youth to reach the stature of maturity. For convenience one may think of this cycle of growth as a succession of four stages of six years each: (1) the preschool years, (2) the elementary years, (3) the secondary school years, (4) the preadult years. . . .
>
> We are now beginning to see this cycle of growth in its true perspective. Thus far, for sound social reasons, the middle twelve years have received most of the attention of the public school system. These are indeed important years for the transmission of cultural inheritance, but the demands of society and the findings of science are compelling us to see a new significance in the preschool years —the fundamental years which come first in the cycle of life, and which therefore claim a certain priority in all social planning. . . .
>
> Growth, therefore, becomes a key concept for the interpretation of individual differences. There are laws of sequency and of maturation which account for the general similarities and basic trends of child development. . . . Each child has a tempo and a style of growth which are as characteristic of individuality as the lineaments of his countenance.

If dentistry for children could assume this viewpoint and perform its operations as a partial contribution to the over-all needs of the growing child, it would increase the beneficial range of its service. Such a viewpoint must come if dentistry for children is to take its place as an authentic health service in a program that will give to this country its highly vital quota of strong, healthy and normally developing children.

### THE HEALTH BACKGROUND OF THE CHILD

The second important problem grows out of the first. Too much dental work is performed on children without relating that treatment properly to the entire physical background of the child. It is true that such a type of dentistry would produce competent, technical operations, but it would be based almost entirely on correction of the defect rather than the prevention of future defects. The reasons that this type of dentistry exists are obvious: the lack of integration between the various health services that deal with the child, the lack of interest in dentistry that characterizes other health service professions; the unavailability of resources needed to study the dental problems of the child in relation to his entire physical welfare.

If these three difficulties can be overcome, dentistry for children will be on a scientific basis. If needed, the report and advice of the psychologist will be available. If needed, a study of food and diet can be made on the individual in question. The endocrinologist, the pediatrician, the nutritionist and a host of other experts will provide the background so that more than restorative dentistry can be attempted. Systemic conditions with dental influences will no longer be allowed to ravage the child merely because they have gone undetected or untreated. This will result in a larger percentage of effectiveness in dental health programs and in an immeasurable contribution to the health of the child as a prospective citizen of his community.

### DENTAL TECHNICS FOR THE CHILD

Dentistry for children is in need of a reexamination of its technics. In many cases, they are sound ones, based on years of profitable experience. In others, they are merely based on a mistaken parallelism with dentistry for adults. The problems may be comparable, but they are not identical. Methods for adults may be comparable with those desirable for children, but they need not be identical. Too often, they are. Many of the methods

that survive in treating children today do so merely because they were relatively effective for adults.

This situation can best be exemplified by a search of dental literature on child psychology. Little new material has been contributed in recent years despite the tremendous strides that have been made in psychologic studies of children. The old classifications—the nervous child, the fearful child, etc.—are retained by most dental writers and the same old half-truths have been handed down from author to author. The methods recommended for handling children are often based on these outmoded classifications and thus establish a permanent and rigid procedure that is not adapted to the needs of the child. Gesell says (p. 7):

> The child has such manifold patterns of behavior which grow so rapidly and undergo such ceaseless, continuous transformations, that there are few absolutes to guide us. We must look for the principle of relativity which is inherent in all development. The ordinary concepts of habit, of intelligence, of mental abilities, can not do justice to the child's ever-changing organization. He is constantly shedding habits or modifying them; his "intelligence" is a dynamic end product of multiple, changing factors; his abilities are all relative to one inclusive ability, namely, the ability to grow.

Dentistry for children must discard these static concepts on which it has based its system of dental treatment. It must plan anew if it is to give to the health of the child that which proper dental care during childhood can give.

These are the three fronts on which children's dentistry must develop to take its place in an expanded national health program. The fact that a separate section meets during this meeting to discuss children's dentistry is one of the most encouraging signs. But it is not enough that those with a durable and authentic interest in this problem hear this discussion. Every dentist who has children in his practice must be brought to the realization of the important work that he is doing when he serves them. It is he who must alter his concept of the child. It is he who must learn to serve a child's dental needs against the greater background of the child's physical needs. It is he who must improve and refine his own technics so that he can take his part in the important rôle that dentistry for children can play in a national health program.

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1002 West Wilson Ave.

# COUNCIL ON DENTAL THERAPEUTICS

## ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

### DENTIFRICES*

***Victor Tooth Powder:*** Composition: See Stevens-Wiley Tooth Powder. (J.A.D.A., **28**:2056, December 1941.)

Manufactured by the Stevens-Wiley Mfg. Co., Inc., Philadelphia, Pa. Distributed by Victor Tea Company, Cleveland, Ohio.

***Stanley Tooth Powder:*** Composition: See Stevens-Wiley Tooth Powder. (J.A.D.A., **28**:2056, December 1941.)

Manufactured by the Stevens-Wiley Mfg. Co., Inc., Philadelphia, Pa. Distributed by Stanley Home Products, Inc., Westfield, Mass.

***Irene's Tooth Powder:*** Composition: See Stevens-Wiley Tooth Powder. (J.A.D.A., **28**:2056, December 1941.)

Manufactured by the Stevens-Wiley Mfg. Co., Inc., Philadelphia, Pa. Distributed by Better Brushes, Inc., Palmer, Mass.

### ANESTHETICS—LOCAL†

***Procaine HCl 2%, Epinephrine 1:50,000:*** Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; sodium chloride, 0.002 gm.; sodium bisulfite, 0.0018 gm.; chlorobutanol (chloroform derivative), 0.005 gm.; epinephrine, 0.00002 gm.; in distilled water. Marketed in tubes, minimum capacity 2.2 cc.

***Procaine HCl 2%, Epinephrine 1:25,000:*** Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; sodium chloride, 0.002 gm.; sodium bisulfite, 0.0018 gm.; chlorobutanol (chloroform derivative), 0.005 gm.; epinephrine, 0.00004 gm.; in distilled water. Marketed in tubes, minimum capacity 2.2 cc.

***Procaine HCl 2%, Neo-Synephrin HCl 1:3500:*** Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; sodium chloride, 0.002 gm.; sodium bisulfite, 0.0018 gm.; chlorobutanol (chloroform derivative), 0.005 gm.; neosynephrine hydrochloride, 0.000285 gm.; in distilled water. Marketed in tubes, minimum capacity 2.2 cc.

Manufactured by Exodontia Products Co. (formerly Neosupracain Co.), Chicago, Ill.

### ANESTHETICS—LOCAL—SLIGHTLY SOLUBLE‡

***Benzocaine-Chlorobutanol-Menthol Solution:*** Each cubic centimeter is stated to contain ethyl aminobenzoate, 0.6 gm.; chlorobutanol anhydrous (chloroform derivative), 0.052 gm.; menthol, 0.031 gm.; carbitol (diethylene glycol monoethyl ether), q.s. 1 cc.

Manufactured by Exodontia Products Co. (formerly Neosupracain Co.), Chicago, Ill.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information regarding the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary*.

*A.D.R. Ed. 7, p. 102.
†A.D.R. Ed. 7, p. 38.
‡A.D.R. Ed. 7, p. 60.

# COMMITTEE ON LEGISLATION

## RECENT DECISIONS

### DENTAL PRACTICE ACTS—PRACTICE OF DENTISTRY BY UNLICENSED PERSON

THE defendant was charged with practicing dentistry without having obtained a license from the Florida Board of Dental Examiners. The testimony indicated that he took an impression of a woman's lower jaw and in so doing employed the materials and apparatus usually used by a dentist and charged for the plate the sum of $15 and made adjustments of the plate in order to obtain a satisfactory fit. The jury reached a verdict of guilty and the defendant was sentenced to pay a fine of $250 and costs, or to be confined in the county jail at hard labor for a period of ninety days. He was further sentenced to confinement in the county jail at hard labor for a period of six months, a sentence which was suspended. On appeal, the circuit court affirmed the judgment and the defendant subsequently obtained a writ of certiorari from the Supreme Court on the ground that there were several errors in the action of the trial court.

The defendant first contended that although he was not a dentist, he was excepted from the provisions of the dental practice act under the section which asserts that the act is inapplicable to persons doing laboratory work on inert matter only. He stated that the complaint was defective because it failed to state that he was not merely performing such work and therefore not within the exception. The court rejected this argument, saying that it was not necessary to state in the complaint that the exception was not applicable to the defendant under the particular circumstances of this case.

The defendant also contended that there was no testimony to show that he took the impressions of the mouths of the witnesses. The court replied to this by saying that there was evidence on both sides of this question and that whether he took the impressions was strictly a question for the jury to decide upon under appropriate instruction.

The defendant next contended that it was an error to deny him the continuance that he requested because of illness. The Supreme Court said that the continuance of a criminal case rests within the sound judicial discretion of the trial court and that the Supreme Court would not interfere with this discretion even though, under the same circumstances, they might have granted the continuance that the defendant had requested.

Lastly, the defendant alleged that it was an error to permit Fred M. York, chairman of the board of dental examiners, to make the statements that he did on cross examination in response to a question from the defendant attorney. The question and answer were as follows:

Q. Then would you say that these teeth that are made through mail order houses, from the outside—a human being couldn't possibly get good teeth—under the law of averages?"

A. They couldn't have teeth as satisfactory as they can be made if the proper kind of impression was made; notwithstanding they won't have something they can't wear. I might say this, however, that the Federal Trade Commission and the Postoffice Department both have issued fraud orders against the principal people who are making

these things by mail, and if you will get their report and read it you will find how they did it as a protection to people who were buying the things, because they said they couldn't be made that way. That kind of business there isn't being done any more because the Federal Trade Commission and the Postoffice Department stopped them.

In reply to this charge, the court said that it failed to find any objection to the testimony, or a motion to have it stricken from the record, or a ruling of the court thereon. Since the statement was made on the defendant's cross examination of the state's witness, the attorney for the defendant is alone responsible for its appearance. The court cannot permit the defendant to profit by his own improper conduct during the progress of the trial.

After examining the whole record, the court concluded, we fail to find any error, and accordingly the petition for writ of certiorari is denied. A petition for a rehearsing was also denied.—Gurr *v.* State 7 So. 2d 590 (Florida 1942).

## BOARD OF DENTAL EXAMINERS: USE OF INJUNCTION TO PREVENT UNLAWFUL PRACTICE.

THE Kentucky Board of Dental Examiners filed an action against the appellant, Jones, to enjoin him from practicing dentistry on the ground that he had not obtained a license from the board. The appellant answered that a judgment had been entered in the year 1934 to enjoin him from practicing anywhere in the state. The court did not allow this as a defense and proceeded to grant the injunction. The appellant then made the present appeal to the Kentucky Court of Appeals.

The Court of Appeals ruled that the appellant's answer to the effect that an injunction had already been issued against him should have been allowed. Since this judgment is still in effect, said the court, the dental board may resort to contempt proceedings for violation of that judgment by the appellant. Since this is all that could be done under the injunction issued in the present case, the rendition of the judgment was superfluous and erroneous.

The argument of the board that the former injunction has no validity because the Dental Practice Act has been amended several times since it was rendered is not tenable, the court continued. It is the rule in this, as well as in most other jurisdictions, that the repeal and simultaneous reenactment of substantially the same statutory provisions is construed as a continuation of the original provisions and not as an implied repeal thereof. Consequently, the provision of the original act requiring a license issued by the board as a prerequisite to practicing dentistry, in effect when the former judgment was rendered, was merely continued in effect by the later acts.

The former judgment is therefore as efficacious to prevent the appellant from practicing dentistry as the judgment appealed from. This being true, the former judgment is *res adjudicata* and the lower court was in error in issuing a second injunction on the same subject matter. Reversed and remanded.—Jones *v.* Kentucky Board of Dental Examiners, 163 S. W. 2d 297 (Kentucky 1942).

# COMMITTEE ON ECONOMICS

## A STUDY OF THE RISING COSTS OF CONDUCTING A DENTAL PRACTICE

By R. M. WALLS,* D.D.S., and M. L. DOLLAR†

THE upturn in business in the United States which began to take on major proportions during the year 1939 was accompanied, as all know, by sharp increases in commodity prices. The factors involved in this rise in price curves are many and complex. The demands of war production for vast quantities of raw materials of all kinds created shortages of materials in the production of commodities for civilian use. This resulted in the bidding up of prices on the limited supplies available. Demands for labor for war production resulted in a shortage of manpower in many occupations, thus creating a laborer's market. The bidding up of wages on the part of industries in order to man their plants to meet unprecedented production demands, coupled with the demands of labor for higher wages in order to meet the higher costs of living, brought about almost universal salary boosts. Again the costs of production were increased.

Thus the spiral of rising costs has pursued its dizzy climb until now, in 1942, the Federal Bureau of Labor statistics reports that the cost of living has risen 30 per cent above the 1939 level. Based on the 1926 wholesale prices as representing a price index of 100, the index number for foods in 1939 was 70.4. This figure has risen in 1941 to an index figure just short of 100. Farm products have risen during this period from 65.3 to 104.5, and the general index for all wholesale commodities has gone up from 77.1 to approximately 100.

To boil this all down to a simple statement of fact, the American dollar of 1939 will buy today about 70 cents worth of goods. The recent application of ceiling prices may help to stem the rising tide, but even if stabilization is achieved, the 30 per cent increase in prices already in effect will probably remain with us for some time.

The Committee on Economics of the American Dental Association, concerned with the economic welfare of the members of the dental profession, determined, some months ago, to investigate the effects of rising prices on the costs of conducting a dental practice. The Committee on Economics of the Minnesota State Dental Association, also interested in the problem, urged that such an investigation be made and offered to cooperate in any possible way.

In his dual rôle as a consumer and as a producer of services to the public which involve overhead costs, the practicing dentist finds himself between two fires as a result of the rapid changes in the price structure. In order to maintain his standard of living, he must increase his income, by enlarging his practice or adjusting his fee schedule, or by both means. It must be left to the individual dentist, who best knows his own practice, to determine which method of maintaining an income level commensurate with the present costs of living is best adapted to his situation. However, if he is to approach the problem of adjusting his income intelligently, he needs to know the increase in his costs of living as a consumer, the effects of increased employment on the size of his practice, the effects of the recent economic changes on the section of the population from which he draws his patients and the effects of increasing prices on the costs of operating a dental office.

It is the last problem, the effects of rising prices on the cost of conducting a dental practice, that the Committee on Economics of the American Dental Association decided to investigate. This problem was selected both because it seems to fall within the scope of the Committee's function and because it

*Chairman of the Committee on Economics.
†Secretary of the Committee on Economics.

TABLE 1.—GEOGRAPHIC DISTRIBUTION OF DENTISTS WHO RETURNED QUESTIONNAIRE ON STUDY OF "RISING COSTS," COMPARED WITH GEOGRAPHIC DISTRIBUTION OF ALL DENTISTS WHO ARE MEMBERS OF AMERICAN DENTAL ASSOCIATION

| Geographic Area | Total Returns | Percentage Distribution of Returns | Percentage Distribution of "Member" Dentists |
|---|---|---|---|
| Total | 1,206 | 100 | 100 |
| New England | 72 | 6.0 | 8.2 |
| Middle Atlantic | 285 | 23.6 | 23.6 |
| East North Central | 334 | 27.7 | 25.5 |
| West North Central | 161 | 13.3 | 12.5 |
| South Atlantic | 95 | 7.9 | 7.8 |
| East South Central | 29 | 2.4 | 3.7 |
| West South Central | 71 | 5.9 | 5.3 |
| Mountain | 35 | 2.9 | 2.9 |
| Pacific | 124 | 10.3 | 10.5 |

TABLE 2.—DISTRIBUTION, ACCORDING TO SIZE OF COMMUNITY IN WHICH PRACTICING, OF DENTISTS WHO RETURNED QUESTIONNAIRE ON STUDY OF "RISING COSTS" COMPARED WITH DISTRIBUTION OF ALL DENTISTS IN U.S.* ACCORDING TO SIZE OF COMMUNITY

| Size of Community | Total Returns | Percentage Distribution of Returns | Percentage Distribution of Dentists in the U.S. |
|---|---|---|---|
| Total | 1,206 | 100 | 100 |
| Under 1,000 | 42 | 3.5 | 5.3 |
| 1,000— 2,499 | 89 | 7.4 | 7.1 |
| 2,500— 4,999 | 65 | 5.4 | 6.3 |
| 5,000— 9,999 | 79 | 6.5 | 6.9 |
| 10,000— 24,999 | 149 | 12.3 | 10.1 |
| 25,000— 49,999 | 105 | 8.7 | 6.6 |
| 50,000— 99,999 | 116 | 9.7 | 7.8 |
| 100,000—499,999 | 213 | 17.7 | 17.0 |
| 500,000 and over | 348 | 28.8 | 32.9 |

*Distribution for U. S. determined on estimates from a selected sample of states.

was possible to obtain reliable data on this question directly from the dentists themselves.

METHOD OF THE STUDY

In order to study this problem, a very simple questionnaire was designed to obtain a comparison for the years 1939, 1940 and 1941 of various items of cost in the conduct

TABLE 3.—AVERAGE RENT PAID FOR DENTAL OFFICES DURING YEARS 1939, 1940 AND 1941; FOR GEOGRAPHIC AREAS

| Geographic Area | 1939 | 1940 | 1941 |
|---|---|---|---|
| Total U.S. | $49.67 | $50.46 | $51.60 |
| New England | 51.27 | 51.11 | 52.42 |
| Middle Atlantic | 66.19 | 67.03 | 68.23 |
| East North Central | 42.83 | 43.51 | 44.72 |
| West North Central | 37.17 | 37.43 | 37.84 |
| South Atlantic | 51.30 | 52.02 | 52.92 |
| East South Central | 32.05 | 32.50 | 32.26 |
| West South Central | 47.80 | 48.60 | 49.29 |
| Mountain | 44.81 | 44.81 | 46.54 |
| Pacific | 50.80 | 52.85 | 55.29 |

TABLE 4.—AVERAGE RENT PAID FOR DENTAL OFFICES DURING YEARS 1939, 1940 AND 1941, ACCORDING TO SIZE OF COMMUNITY

| Size of Community | 1939 | 1940 | 1941 |
|---|---|---|---|
| Total U.S. | $49.67 | $50.46 | $51.60 |
| Under 1,000 | $19.84 | $19.62 | $20.83 |
| 1,000— 2,499 | 22.35 | 22.58 | 22.88 |
| 2,500— 4,999 | 31.10 | 32.20 | 32.60 |
| 5,000— 9,999 | 33.16 | 33.53 | 33.97 |
| 10,000— 24,999 | 40.74 | 41.06 | 42.38 |
| 25,000— 49,999 | 43.41 | 44.07 | 45.53 |
| 50,000— 99,999 | 54.15 | 54.97 | 56.82 |
| 100,000—499,999 | 54.42 | 55.98 | 56.99 |
| 500,000 and over | 66.97 | 67.88 | 69.16 |

of a dental practice. In the questionnaire, costs were broken down under five major headings: office rent, salaries, laboratory work, supplies and miscellaneous. These questionnaires were sent out to a carefully selected sample of 5,000 dentists. From these 5,000 dentists, 1,312 replies were received. This represents a highly satisfactory response of more than 26 per cent of all the dentists

contacted. The committee is pleased with the cooperation of the members of the profession. With continued assistance of this kind, the committee will be able to serve the profession effectively.

Of the 1,312 replies, it was possible to utilize 1,206 in the study. The schedules not used were rejected for such reasons as the following: The dentist moved his office during the period under study, making it impos-

TABLE 5.—OFFICE RENTS IN 1940 AND 1941 COMPARED WITH OFFICE RENTS IN 1939: PERCENTAGE REPORTING RENT INCREASES; AVERAGE PERCENTAGE INCREASE FOR ALL DENTAL OFFICES; AVERAGE PERCENTAGE INCREASE FOR OFFICES WHERE RENTS WERE RAISED; FOR GEOGRAPHIC AREAS

| Geographic Areas | 1940 Rents Compared with 1939 Rents | | | 1941 Rents Compared with 1939 Rents | | |
|---|---|---|---|---|---|---|
| | Dentists Reporting Increased Rents Per Cent | Increase in Rent for All Offices Per Cent | Increase for Offices Where Rents Were Raised Per Cent | Dentists Reporting Increased Rents Per Cent | Increase in Rent for All Offices Per Cent | Increase for Offices Where Rents Were Raised Per Cent |
| Total U. S. | 14.06 | 2.14 | 15.19 | 26.00 | 5.04 | 19.39 |
| New England | 9.68 | .73 | 7.50 | 26.23 | 3.77 | 14.37 |
| Middle Atlantic | 15.57 | 2.23 | 14.34 | 27.16 | 4.76 | 17.54 |
| East North Central | 15.99 | 2.53 | 15.80 | 29.93 | 5.89 | 19.69 |
| West North Central | 7.19 | 1.37 | 19.00 | 13.77 | 3.10 | 22.50 |
| South Atlantic | 9.76 | 1.22 | 12.50 | 19.51 | 3.26 | 16.72 |
| East South Central | 12.50 | 2.40 | 19.17 | 13.04 | 4.35 | 33.33 |
| West South Central | 15.39 | 2.60 | 16.88 | 27.45 | 5.98 | 21.79 |
| Mountain | 14.82 | 1.30 | 8.75 | 29.63 | 5.83 | 19.69 |
| Pacific | 19.63 | 3.30 | 16.79 | 31.78 | 6.94 | 21.84 |

TABLE 6.—OFFICE RENTS IN 1940 AND 1941 COMPARED WITH OFFICE RENTS IN 1939; PERCENTAGE REPORTING RENT INCREASES; AVERAGE PERCENTAGE INCREASE FOR ALL DENTAL OFFICES; AVERAGE PERCENTAGE INCREASE FOR OFFICES WHERE RENTS WERE RAISED; FOR SIZE OF COMMUNITY GROUPS

| Size of Community Groups | 1940 Rents Compared with 1939 Rents | | | 1941 Rents Compared with 1939 Rents | | |
|---|---|---|---|---|---|---|
| | Dentists Reporting Increased Rents Per Cent | Increase in Rent for All Offices Per Cent | Increase for Offices Where Rents Were Raised Per Cent | Dentists Reporting Increased Rents Per Cent | Increase in Rent for All Offices Per Cent | Increase for Offices Where Rents Were Raised Per Cent |
| Total U. S. | $14.06 | $ 2.14 | $15.19 | $26.00 | $ 5.04 | $19.39 |
| Under 1,000 | 8.83 | 1.40 | 15.83 | 20.59 | 5.88 | 28.57 |
| 1,000— 2,499 | 10.45 | 2.02 | 19.29 | 16.42 | 3.43 | 20.91 |
| 2,500— 4,999 | 15.69 | 3.77 | 24.06 | 21.57 | 5.69 | 26.36 |
| 5,000— 9,999 | 13.24 | 2.13 | 16.11 | 19.12 | 4.45 | 23.27 |
| 10,000— 24,999 | 6.06 | 1.19 | 19.69 | 18.46 | 4.14 | 22.40 |
| 25,000— 49,999 | 15.22 | 2.47 | 16.25 | 26.67 | 5.97 | 22.40 |
| 50,000— 99,999 | 11.76 | 1.84 | 15.63 | 22.55 | 5.00 | 22.17 |
| 100,000—499,999 | 17.03 | 2.31 | 13.55 | 34.78 | 5.38 | 15.47 |
| 500,000 and over | 17.49 | 2.28 | 13.02 | 28.90 | 5.06 | 17.50 |

sible to compare rental rates for each of the three years. The dentist had entered practice since 1939. The dentist had entered the army prior to or during 1941. The replies that were used in the study proved to be most satisfactorily distributed with regard to the major factors which it was possible to control in determining the representatives of the sample; namely, geographic distribution and size of community.

It was desired to compare costs for various sections of the country and for communities of various sizes. Accordingly, the sample has been broken down into the nine major geographic areas that are used by the Bureau of Census in reporting population statistics. (Fig. 1.) The sample has also been broken down according to nine "size of community" groups. The distribution of the questionnaires with respect to the geographic area and the size of the community in which the dentist reporting was practicing is shown in Tables 1 and 2. These tables also show a comparison of the distribution of the sample group with the distribution of all dentists. Figures 2 and 3 show clearly how slight are the deviations of the sample from the distribution of the entire profession.

TABLE 7.—DISTRIBUTION OF MONTHLY RENTAL RATES FOR DENTAL OFFICES ACCORDING TO GEOGRAPHIC AREA (1939)

| Monthly Rental | Total United States | Geographic Area | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | New England | Middle Atlantic | East North Central | West North Central | South Atlantic | East South Central | West South Central | Mountain | Pacific |
| Total | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent |
| Under $10 a month | 0.4 | — | 0.8 | — | 1.5 | — | — | — | — | — |
| 10— 14 | 2.0 | 1.7 | 0.8 | 1.7 | 2.2 | 3.9 | 19.0 | 2.0 | 3.8 | — |
| 15— 19 | 5.0 | 3.3 | 1.7 | 5.5 | 11.9 | 6.5 | 14.3 | 6.1 | 3.8 | — |
| 20— 24 | 6.0 | 3.3 | 0.4 | 7.2 | 11.2 | 7.8 | 14.3 | 12.2 | 11.5 | 2.8 |
| 25— 29 | 12.2 | 11.7 | 6.7 | 15.4 | 19.4 | 6.5 | 14.3 | 22.4 | 7.7 | 6.6 |
| 30— 34 | 9.1 | 5.0 | 5.0 | 11.6 | 14.2 | 3.9 | 4.8 | 8.2 | 11.5 | 11.3 |
| 35— 39 | 8.8 | 3.3 | 5.5 | 11.6 | 7.5 | 10.4 | 4.8 | 6.1 | 3.8 | 15.1 |
| 40— 44 | 10.7 | 15.0 | 10.5 | 9.2 | 9.0 | 10.4 | 9.5 | 8.2 | 11.5 | 15.0 |
| 45— 49 | 6.0 | 10.0 | 4.2 | 9.6 | 4.5 | 3.9 | — | — | 7.7 | 4.7 |
| 50— 54 | 11.6 | 13.3 | 16.8 | 9.9 | 6.7 | 9.1 | 4.8 | 10.2 | 7.7 | 14.2 |
| 55— 59 | 3.5 | 1.7 | 4.2 | 4.8 | 1.5 | 5.2 | 4.8 | — | 3.8 | 1.9 |
| 60— 64 | 5.4 | 11.7 | 6.3 | 3.4 | 0.7 | 11.7 | — | 4.1 | 7.7 | 7.5 |
| 65— 69 | 3.0 | 3.3 | 4.6 | 2.7 | 2.2 | 3.9 | — | 4.1 | 3.8 | — |
| 70— 74 | 2.5 | 1.7 | 2.9 | 1.4 | 0.7 | 3.9 | 9.5 | 2.0 | 7.7 | 3.8 |
| 75— 79 | 4.5 | 8.3 | 8.8 | 1.0 | 2.2 | 2.6 | — | — | — | 8.5 |
| 80— 84 | 1.5 | — | 2.5 | 1.0 | 1.5 | 1.3 | — | 2.0 | — | 1.9 |
| 85— 89 | 1.1 | 1.7 | 2.5 | 0.7 | — | 1.3 | — | — | — | 0.9 |
| 90— 94 | 1.6 | 1.7 | 3.3 | 0.7 | — | 1.3 | — | 4.1 | — | 1.9 |
| 95— 99 | 0.3 | — | 0.8 | — | — | — | — | — | — | 0.9 |
| 100—149 | 3.9 | 3.3 | 8.0 | 1.7 | 3.0 | 5.2 | — | 6.1 | — | 1.9 |
| 150—199 | 0.8 | — | 1.7 | 0.7 | — | 1.3 | — | 2.0 | — | — |
| 200—299 | 0.1 | — | 0.4 | — | — | — | — | — | — | — |
| 300 and over | 0.3 | — | 1.3 | — | — | — | — | — | — | — |

Space will permit reporting in the present issue of THE JOURNAL the findings on only one of the items of cost that were investigated. The present report will cover only rental rates of dental offices. This is, of course, one of the most important items of cost, since, as was pointed out in a study by Leven and Beck,[1] office rent accounts for approximately 20 per cent of all costs in the conduct of a dental practice. Rental rates are presented in terms of a comparison of average rental rates for each of the three years under study for various sections of the country and for communities of various sizes; the percentage of office rents that were increased and the magnitude of these increases, and the range of office rents paid in various sections of the country and in communities of various sizes.

TABLE 8.—DISTRIBUTION OF MONTHLY RENTAL RATES FOR DENTAL OFFICES ACCORDING TO SIZE OF COMMUNITY (1939)

| Monthly Rental | Total | Size of Community | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Under 1,000 | 1,000 to 2,499 | 2,500 to 4,999 | 5,000 to 9,999 | 10,000 to 24,999 | 25,000 to 49,999 | 50,000 to 99,999 | 100,000 to 499,999 | 500,000 and over |
| Total | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent | 100 Per Cent |
| Under $10 a month | 0.4 | 3.1 | 3.1 | — | — | 0.8 | — | — | — | — |
| 10— 14 | 2.0 | 21.9 | 15.4 | — | 2.9 | — | 1.1 | — | — | — |
| 15— 19 | 5.0 | 43.8 | 18.5 | 14.0 | 7.4 | 4.1 | 3.4 | 2.1 | 1.1 | — |
| 20— 24 | 6.0 | 9.4 | 26.2 | 14.0 | 11.8 | 4.1 | 2.2 | 3.1 | 6.0 | 1.3 |
| 25— 29 | 12.2 | 18.8 | 24.6 | 28.0 | 25.0 | 18.7 | 15.7 | 2.1 | 8.2 | 4.7 |
| 30— 34 | 9.1 | — | 7.7 | 22.0 | 20.6 | 8.1 | 15.7 | 3.1 | 9.3 | 5.7 |
| 35— 39 | 8.8 | — | 3.1 | 8.0 | 8.8 | 13.0 | 10.1 | 11.5 | 7.1 | 9.1 |
| 40— 44 | 10.7 | — | 1.5 | 4.0 | 7.4 | 17.9 | 19.1 | 10.4 | 13.7 | 8.4 |
| 45— 49 | 6.0 | — | — | 4.0 | 2.9 | 7.3 | 5.6 | 10.4 | 6.6 | 6.7 |
| 50— 54 | 11.6 | — | — | 2.0 | 8.8 | 13.8 | 9.0 | 16.7 | 13.1 | 14.8 |
| 55— 59 | 3.5 | — | — | — | — | 2.4 | 3.4 | 7.3 | 4.4 | 4.7 |
| 60— 64 | 5.4 | 3.1 | — | — | 2.9 | 3.3 | 4.5 | 12.5 | 4.9 | 7.4 |
| 65— 69 | 3.0 | — | — | — | 1.5 | 1.6 | 1.1 | 4.2 | 4.4 | 4.7 |
| 70— 74 | 2.5 | — | — | 2.0 | — | 1.6 | 1.1 | 3.1 | 4.4 | 3.4 |
| 75— 79 | 4.5 | — | — | 2.0 | — | 1.6 | 2.2 | 7.3 | 4.9 | 8.1 |
| 80— 84 | 1.5 | — | — | — | — | 1.6 | 3.4 | — | 1.6 | 2.4 |
| 85— 89 | 1.1 | — | — | — | — | — | 1.1 | — | 0.5 | 3.0 |
| 90— 94 | 1.6 | — | — | — | — | — | — | 4.2 | 1.6 | 3.0 |
| 95— 99 | 0.3 | — | — | — | — | — | — | — | 0.5 | 0.7 |
| 100—149 | 3.9 | — | — | — | — | — | 1.1 | 2.1 | 6.6 | 8.1 |
| 150—199 | 0.8 | — | — | — | — | — | — | — | 1.1 | 2.4 |
| 200—299 | 0.1 | — | — | — | — | — | — | — | — | 0.3 |
| 300 and over | 0.3 | — | — | — | — | — | — | — | — | 1.0 |

1. LEVEN, MAURICE, and BECK, DOROTHY F.: Practice of Dentistry and Incomes of Dentists in Twenty States: 1929. Chicago: University of Chicago Press, 1932.

### AVERAGE MONTHLY RATES FOR DENTAL OFFICES

The average rent paid for a dental office in the United States during the year 1939 was $49.67 a month. However, this national

average does not adequately describe the rent level for all sections of the country. Actually, the average rental for dental offices within each of the nine major geographic areas in the country ranges from The Pacific, New England, South Atlantic and Middle Atlantic states all had average rental rates during 1939 of more than $50 per month. The first three of these areas had almost identical average rental rates of ap-

TABLE 9.—DISTRIBUTION* OF RENTAL RATES ON DENTAL OFFICES FOR YEARS 1939 AND 1941 FOR GEOGRAPHIC AREAS

| Geographic Area | 1939 | | | 1941 | | |
|---|---|---|---|---|---|---|
| | 25% of Rates Less Than | 50% of Rates Less Than | 75% of Rates Less Than | 25% of Rates Less Than | 50% of Rates Less Than | 75% of Rates Less Than |
| Total United States | $29.75 | $43.05 | $59.55 | $31.10 | $45.75 | $63.65 |
| New England | 35.00 | 48.35 | 62.75 | 36.00 | 50.40 | 63.35 |
| Middle Atlantic | 41.95 | 54.25 | 77.60 | 43.25 | 58.60 | 79.15 |
| East North Central | 28.40 | 38.70 | 51.60 | 29.40 | 41.10 | 53.60 |
| West North Central | 24.20 | 31.35 | 43.95 | 24.85 | 32.20 | 47.80 |
| South Atlantic | 30.40 | 45.75 | 63.15 | 33.35 | 51.85 | 69.35 |
| East South Central | 17.10 | 25.85 | 41.85 | 19.50 | 28.75 | 51.00 |
| West South Central | 26.05 | 34.45 | 54.80 | 27.05 | 35.85 | 63.00 |
| Mountain | 28.85 | 43.45 | 61.40 | 30.85 | 43.75 | 66.00 |
| Pacific | 36.40 | 44.45 | 61.60 | 38.95 | 48.75 | 64.70 |

*Quartile distribution.

TABLE 10.—DISTRIBUTION* OF RENTAL RATES ON DENTAL OFFICES FOR YEARS 1939 AND 1941 ACCORDING TO SIZE OF COMMUNITY

| Geographic Area | 1939 | | | 1941 | | |
|---|---|---|---|---|---|---|
| | 25% of Rates Less Than | 50% of Rates Less Than | 75% of Rates Less Than | 25% of Rates Less Than | 50% of Rates Less Than | 75% of Rates Less Than |
| Total United States | $29.75 | $43.05 | $59.55 | $31.10 | $45.75 | $63.65 |
| Under 1,000 | 15.00 | 17.85 | 23.30 | 15.60 | 18.85 | 25.35 |
| 1,000— 2,499 | 16.75 | 22.50 | 27.40 | 17.35 | 23.60 | 28.40 |
| 2,500— 4,999 | 23.95 | 28.95 | 34.30 | 24.85 | 30.60 | 37.20 |
| 5,000— 9,999 | 25.60 | 30.70 | 39.15 | 25.65 | 31.35 | 40.60 |
| 10,000— 24,999 | 29.30 | 40.35 | 50.35 | 32.15 | 42.90 | 54.75 |
| 25,000— 49,999 | 30.85 | 40.45 | 51.15 | 31.95 | 42.15 | 54.70 |
| 50,000— 99,999 | 41.50 | 52.20 | 63.60 | 43.85 | 54.25 | 71.15 |
| 100,000—499,999 | 35.30 | 48.50 | 65.70 | 37.35 | 50.10 | 69.50 |
| 500,000 and over | 42.50 | 54.75 | 77.55 | 45.60 | 59.05 | 78.65 |

*Quartile distribution.

$32.05 in the East South Central states to $66.19 in the Middle Atlantic states. As can be seen from Figure 4, the central states, including four of the nine geographic areas, enjoy relatively low rental rates as compared with the coastal areas in the east and west. proximately $51 per month. Influenced by the extremely high rates prevalent in New York City, the Middle Atlantic states, as noted above, had an average rental rate of $66.19.

While most commodity prices increased

considerably during 1939-1941, the average rental rates on dental offices appear to have been but slightly raised during this period. tional average increased only about $1 a year or approximately 2 per cent a year. While the increase in the average rental rates was

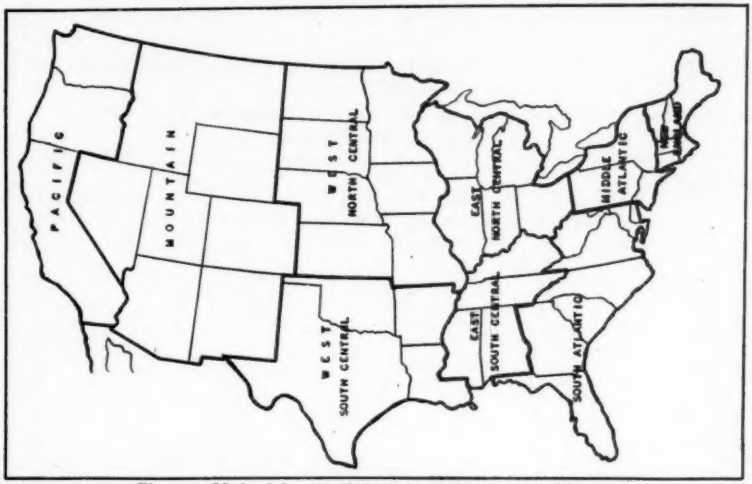



Fig. 1.—United States divided into nine geographic areas.

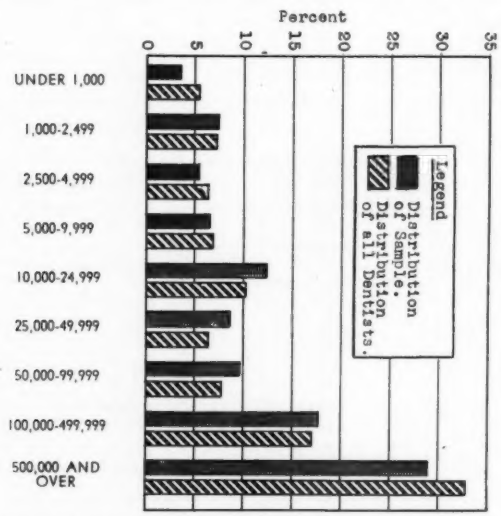



Fig. 2.—Distribution of dentists who returned questionnaire on study of rising costs compared with distribution of all dentists in United States according to size of community in which practicing. (Distribution for United States determined on estimates from selected sample of states.)

The national rental average increased from $49.67 in 1939 to $50.46 in 1940, and to $51.60 in 1941. (Table 3.) Thus the na- slight, it appears to have been consistent in most of the nine geographic areas. This can be seen by an examination of Figure 5,

which shows a comparison of the average rental rates for each area for the years 1939, 1940 and 1941. As in Figure 4, the geographic areas have been arranged in Figure 5 in sequence according to the average rental rate in 1939. For each area, there are shown three bars, distinguished by different patterns of crosshatching, indicating the average rental rate for each of the years 1939, 1940 and 1941. As has been stated, the striking fact brought out by this graph is the slight amount of increase in the rental rates

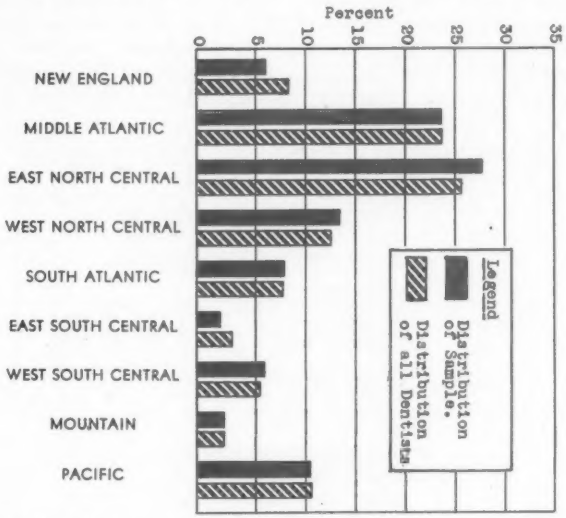



Fig. 3.—Geographic distribution of dentists who returned questionnaire on study of rising costs compared with geographic distribution of all dentists who are members of American Dental Association.

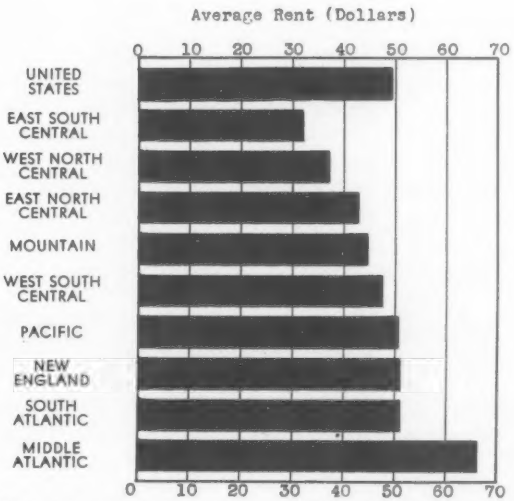



Fig. 4.—Geographic areas arranged in sequence according to average rental rates for 1939.

in each of the geographic areas. The Pacific states showed the largest increase in rental rates, rising from $50.80 in 1939 to $52.85 in 1940 and to $55.29 in 1941. The percentage increase in the average rental rates for each of the geographic areas during the years 1940 and 1941 is shown in Figures 6 and 7.

A comparison of the average rental rates in communities of various sizes shows even greater differences than those observed in the rental rates for the various sections of the country. It is interesting to note, also, the close correlation between the size of a community and the average rental rate for dental offices. (Table 4.) In communities having a population of less than 1,000, the average rental was found to be $19.84 during the year 1939; in communities having a population of between 1,000 and 2,499, $22.35; in communities with a population of 2,500-4,999, $31.10. The average rental rate continued to rise in this fashion through each of the nine "size of community" groups utilized in this study. Communities of more than 500,000 had the highest average rate ($66.97). It is observed that the average

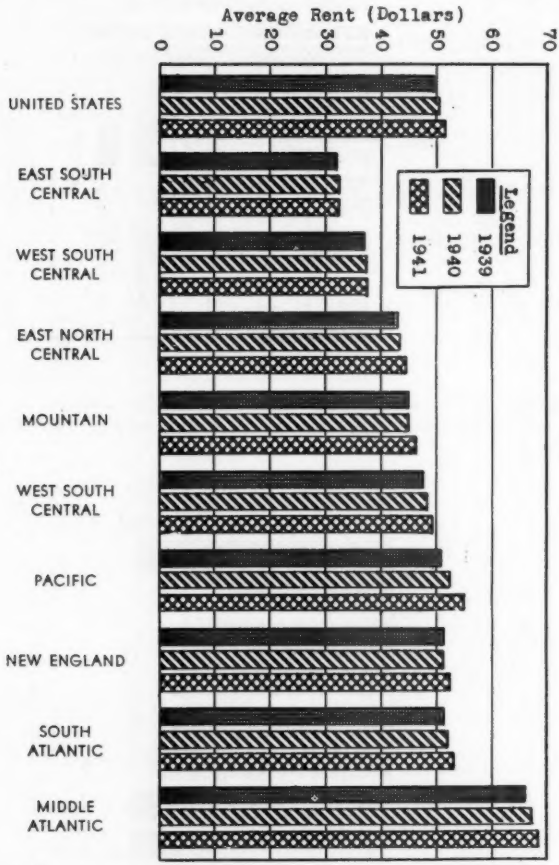



Fig. 5.—Comparison of average monthly rental rates for dental offices for years 1939, 1940 and 1941 by geographic area. (Geographic areas arranged in sequence according to average rental rates in 1939.)

rental rate in the largest cities is more than three times as great as the rate in communities of less than 2,500 population.

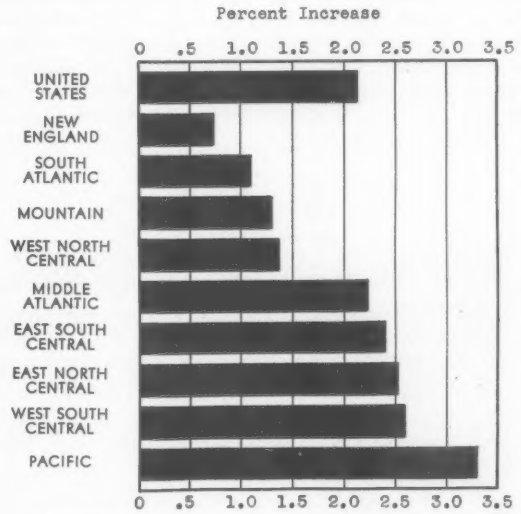



Fig. 6.—Geographic areas arranged in sequence according to average percentage increase in rents for all dental offices between years 1939 and 1940.

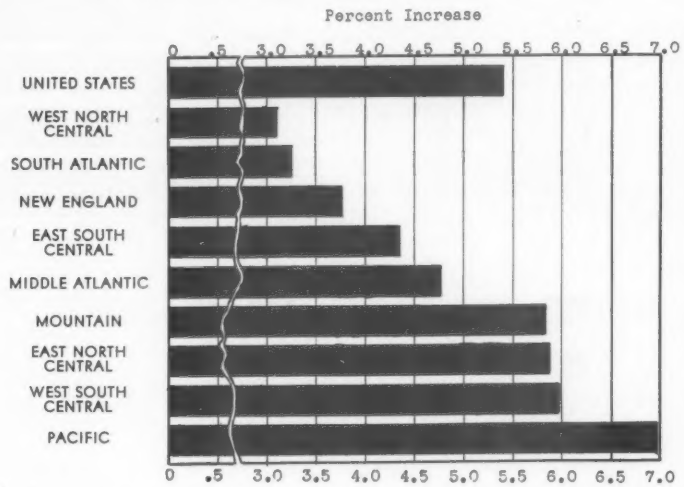



Fig. 7.—Geographic areas arranged in sequence according to average percentage increase in rents for all dental offices between years 1939 and 1941.

The increase in average rental rates seems to have been about equal for communities of all sizes. In most instances, the yearly increase in rental rate was about $1 over the 1939 figure for each of the years 1940 and 1941.

PERCENTAGE OF OFFICE RENTS INCREASED; MAGNITUDE OF INCREASES

While the increase in office rents during

the period covered by the study appears negligible when viewed as an average, it must be kept in mind that actually the increased burden is not evenly distributed among all practicing dentists. During the year 1940, the rental rates for 83.7 per cent of the dental offices remained unchanged, while 2.2 per cent showed a decrease in rental rates. Thus the burden of the rent increase fell on only 14.1 per cent of the dentists. This group had to shoulder an increase of more than 15 per cent in their rental rates. (Table 5.) By the end of 1941, the rental rate on 26 per cent of all dental offices was increased. For this group, the rental rate in 1941 was approximately one-fifth greater than the 1939 rate (19.4 per cent).

The distribution of the rent increases for the years 1940 and 1941 is clearly depicted in Figures 8 and 9 by means of 100 per cent bars. As indicated by the legend, three patterns of crosshatching are used to show the percentage of dental offices for which rental rates were decreased, unchanged or increased.

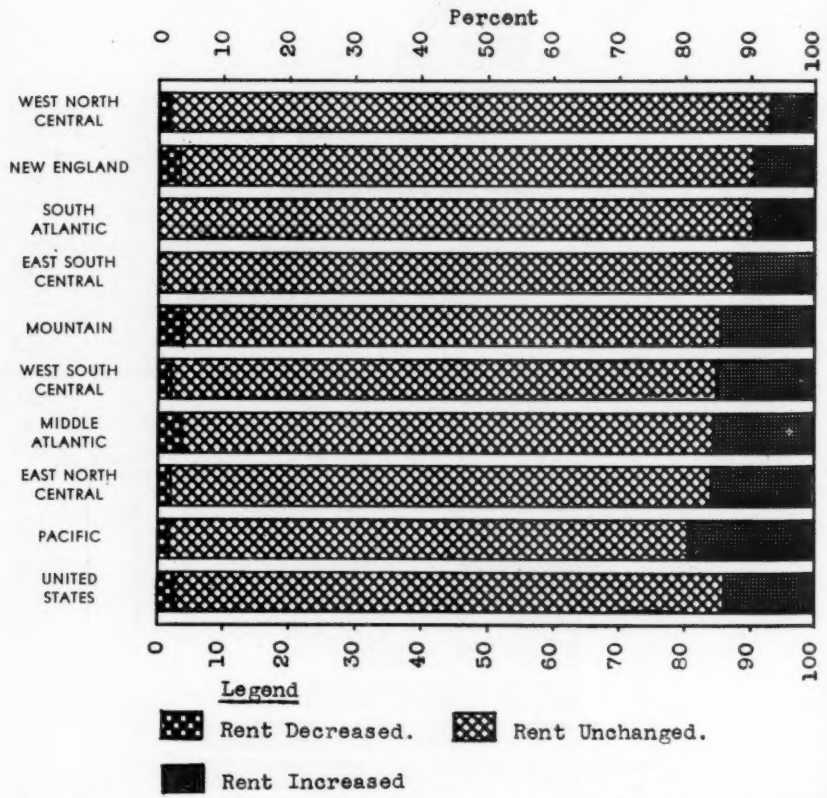



Fig. 8.—Percentage of dentists reporting office rents increased, decreased or unchanged between years 1939 and 1940.

The bars, representing each of the nine geographic areas, are arranged in sequence according to the percentage of the dental offices experiencing an increase in rental rates. It can be seen that the rental rates were increased on fewer offices in the West North Central states (7.2 per cent) than in

any other area. The New England states and the South Atlantic states also showed relatively few increases, with slightly less than 10 per cent of the offices affected. The rental rates in the Pacific area responded more quickly to the rising price trend than any other area. Here, about 19.6 per cent of the dental offices had rent increases during the year 1940. By the end of the year 1941, the rental rates in nearly all sections per cent of the rates, the remaining areas show about the same percentage of rental rates increased, ranging from 26.2 per cent in New England to 31.8 per cent in the Pacific area.

Although in a large proportion of the cases, office rents were not raised at all during the period 1939-1941, the increase in rental rates was considerable for the 15 to 30 per cent whose rents were affected. For

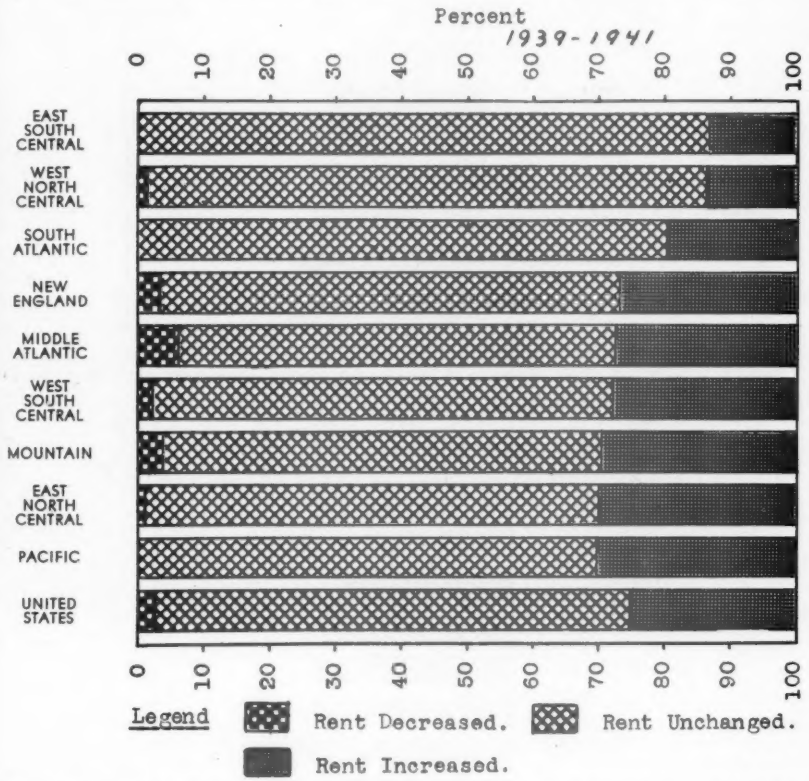



Fig. 9.—Percentage of dentists reporting office rents increased, decreased or unchanged between years 1939 and 1941.

of the United States had responded to the rising price trend. (Fig. 7.) The East South Central and the West North Central areas lagged behind in the race to increase rental rates. In these sections, the increase affected about 13 or 14 per cent of the dental offices. With the exception of the South Atlantic states, which showed increases in about 20 the entire United States, the average increase in 1940 represented a boost of approximately 15.2 per cent over the 1939 figure. In 1941, the increases were even larger, amounting to an increase of 19.4 per cent over the 1939 figure. There was considerable variation in the extent of the increase in various sections of the country. In 1940, the New England

states showed the smallest proportionate increase with an average boost of 9.7 per cent. (Figs. 10 and 11.) The dentists in the East South Central states were hardest hit, since their average increase amounted to 19.2 per cent. In 1941, not only were the rents increased on a larger number of offices than in 1940, but the average amount of the increase was greater also. Again, in 1941, the New England states showed the smallest average

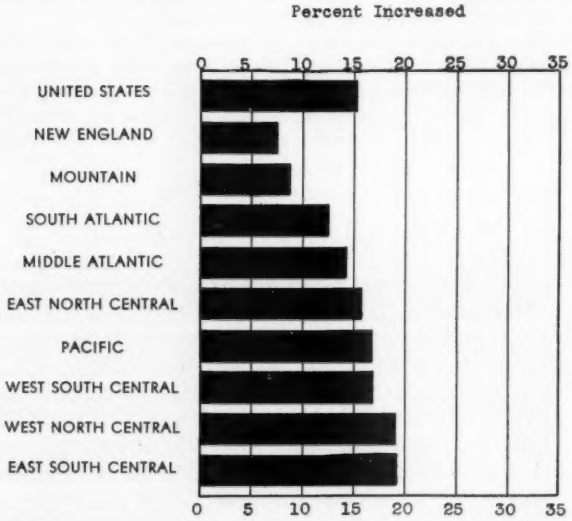



Fig. 10.—Geographic areas arranged in sequence according to average percentage increase in rents for dental offices in 1940 over 1939 rentals.

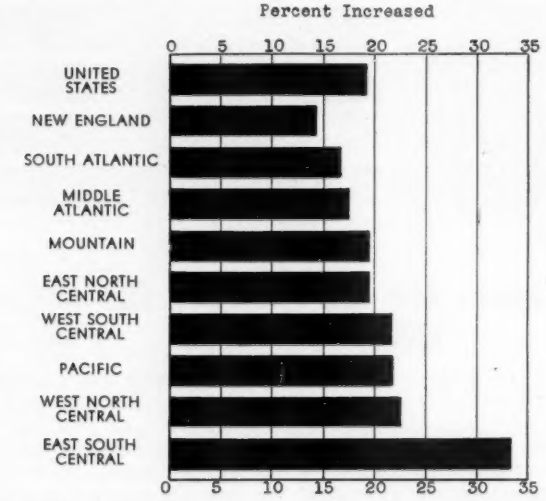



Fig. 11.—Geographic areas arranged in sequence according to average percentage increase in rents for dental offices in 1941 over 1939 rentals.

increase, with a jump of 14.4 per cent over the 1939 rentals on those offices where the rents were raised. The East South Central states retained their position, also, as the section showing the largest average increase in rental rates. In this section, rental increases in 1941 averaged 33.3 per cent of the 1939 rates. However, the fact that the number of questionnaires returned from that area was relatively small casts some doubt upon the reliability of this figure.

For the year 1940, there seems to be little correlation between the amount of the increase in rental rates and the size of the community. Increases over the 1939 rates ranged between 13.0 and 24.1 per cent. (Table 6.) Further increases in rental rates during 1941 do appear, however, to be negatively correlated with "size of community." The increases range from 28.6 per cent over the 1939 rates for communities "Under 1,000 population" down to 17.5 per cent over the

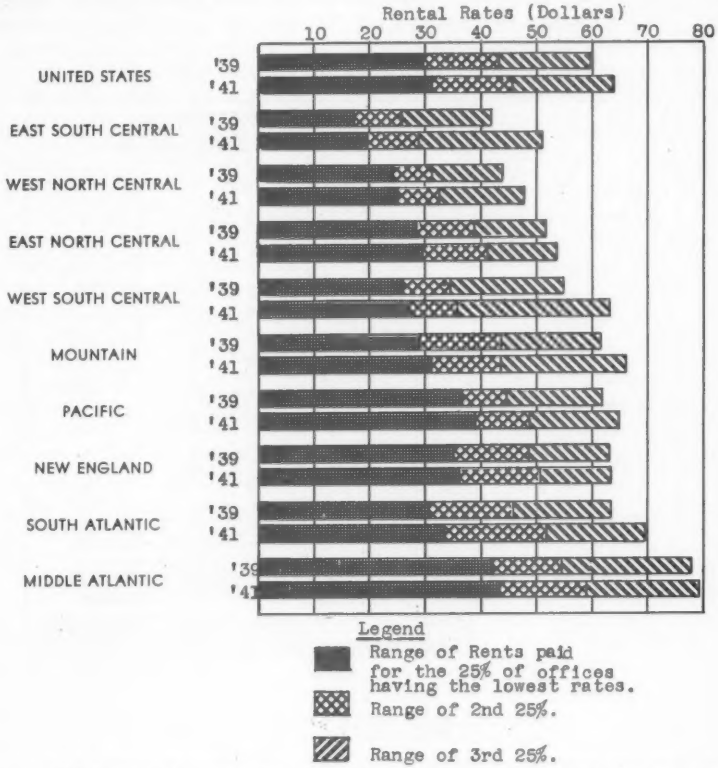



Fig. 12.—Distribution of rental rates on dental offices for years 1939 and 1941 by geographic area. (Quartile distribution: The bars in the graph represent the range of rental rates for all dental offices, divided into four groups each containing 25 per cent of all dental offices. The first section of each bar represents the range of rental rates for the one-fourth of the dental offices having the lowest rent. The second and third sections represent the range of rental rates for the one-fourth of the offices coming second in the scale of rents and the one-fourth coming third in the scale of rents. The one-fourth of the offices having the highest rental rates are scattered over such a wide range that it was not practical to show the upper limit [over $300] of this group on the graph. It is simply indicated that the rates for this upper group lie above the end of the range of the third group.)

1939 rates for communities with a population of 500,000 or more.

### RANGE OF OFFICE RENTS

Should the analysis be limited to an examination of average rentals only, without viewing the actual range of rental rates for dental offices, some interesting and significant aspects of the rental situation would be obscured. The percentage of dental offices for the year 1939 falling in each rental rate group beginning with $10 per month and increasing by $5 intervals up to $100 per month and by larger intervals up to $300 per month are shown for each of the nine geographic areas and for each "size of community" group in Tables 7 and 8. To summarize the data in these tables for purposes of comparison, a quartile distribution of rental rates has been computed; that is to say, the range of rates for the 25 per cent of the offices having lowest rates, the 25 per cent of the offices having the next lowest rates, and so on, for four groups, each containing one-fourth of the dental offices. (Figs. 12 and 13; Tables 9 and 10.) During 1939, in the whole United States, one-fourth of the dental offices rented for less than $29.75; one-fourth rented for between $29.75 and $43.05; one-fourth rented for between $43.05 and $59.55, while one-fourth rented for more than $59.55. In the East South Central states, one-fourth of the dental offices rented for less than $17.10; one-fourth of the rental

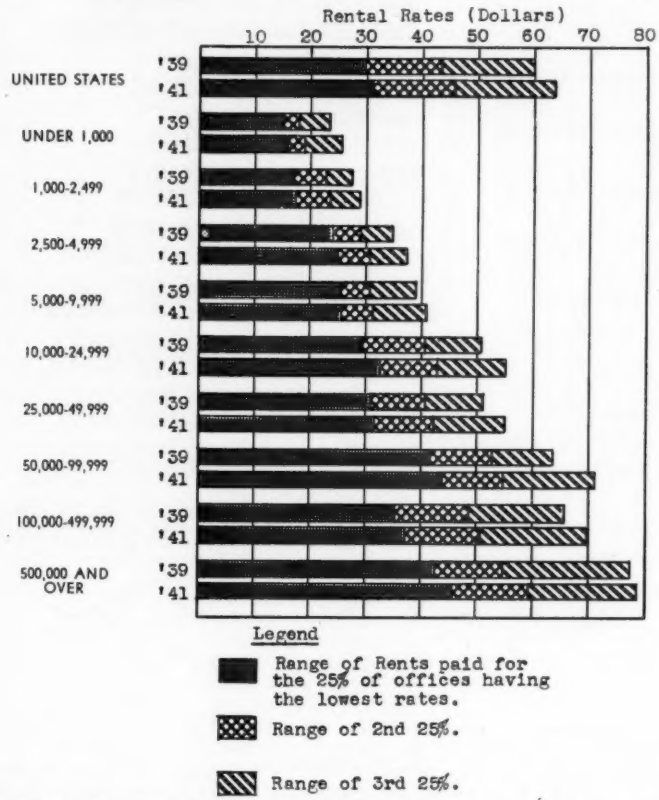



Fig. 13.—Distribution of rental rates on dental offices for years 1939 and 1941 according to size of community. (See Figure 12: Quartile distribution.)

rates fell between $17.10 and $25.85; one-fourth fell between $25.85 and $41.85, and the rental rate on one-fourth of the offices was more than $41.85. It is found that, in the Middle Atlantic states, the lowest one-fourth paid less than $41.95, whereas three-fourths of all of the offices in the East South Central states paid less than that amount for rent. Further, in the Middle Atlantic states, one-fourth of the rental rates ranged between $41.95 and $54.25 and one-fourth between $54.25 and $77.60, and one-fourth of the rates were above $77.60. Similar comparisons can be made between other geographic areas by reference to Table 9 and Figure 12.

The correlation between size of community and rental rates that was revealed in the comparison of average rental rates is brought out even more strikingly in a comparison of the distribution of rental rates in communities of various sizes. In communities of less than 1,000 population, one-fourth of the dental offices rent for less than $15.00 a month; one-fourth fall between $15.00 and $17.85 and one-fourth between $17.85 and $23.30, and one-fourth rent for more than $23.30. In cities of more than 500,000 population, the rental rates for the lowest one-fourth falls below $42.50; one-fourth of the rates fall between $42.50 and $54.75 and one-fourth between $54.75 and $77.55, and one-fourth of the rents are for more than $77.55. For communities intermediate in size between the smallest and largest communities compared above, the distribution of rental rates falls almost without exception in a regular sequence of increasing rates with each increase in the size of the communities under consideration.

## SUMMARY

The average rental rate for dental offices in the United States during the year 1939 was $49.67. The average rose to $50.46 in 1940 and to $51.60 in 1941. The average rental rate was lowest in the East South Central states ($32.05 in 1939) and highest in the Middle Atlantic states ($66.19 in 1939). While the increases in the average rentals during this period were not large, actually a relatively small percentage of the dentists carried the burden of the increase. The group who actually experienced increases in the rental rate on their offices included 14 per cent of all dentists having offices in 1940 and 26 per cent in 1941. The rental rates on the office of this group were increased over the 1939 figure by 15 per cent in 1940 and by 19 per cent in 1941.

Average rental rates are closely correlated with size of community. In communities having a population of less than 1,000, the average rental rate was $19.84 during the year 1939; in communities between 25,000 and 49,999 population, $43.41, and in communities over 500,000 population, $66.97. No large differences were noted in the percentage increase in rental rates for communities of various sizes.

The range of rental rates for dental offices may be described as follows: In the United States during 1939, one-fourth of the dental offices rented for less than $29.75, one-fourth for from $29.75 to $43.05, one-fourth for $43.05 to $59.55 and one-fourth for more than $59.55.

Conclusions cannot be drawn, of course, from the analysis of this single item of cost, rent, as to policy with regard to altering fee schedules to meet the emergency of spiraling prices and increasing costs. If rent were the only item of consideration, it is obvious that the question of altering fees to meet rising costs would not be a problem of concern to all members of the profession, but would be limited to the 26 per cent of the dentists who have been affected by increased office rental rates. Obviously, many other items such as labor costs, laboratory costs, and equipment and supplies must be taken into consideration in a study of costs. A report on the findings of the committee's investigation of these items of cost will be released soon.

# REPORT OF THE PAN AMERICAN RELATIONS COMMITTEE

## (1941-1942)

*To the Officers, Board of Trustees and House of Delegates of the American Dental Association:*

In the year 1940, the Research Commission of the American Dental Association sent a complimentary copy of "Dental Caries" to Juan Ubaldo Carrea, president of the Federación Odontológica Latino Americana, Buenos Aires, Argentina. In the letter accompanying the book, as secretary of the Commission, I made reference to a desire for a more extensive exchange of dental knowledge among the Americas. Dr. Carrea, in his reply, concurred and expressed the wish for closer relations. He suggested that ways and means be devised for the American Dental Association to participate in the Fifth Dental Congress of the Federación Odontológica Latino Americana (F.O.L.A.), to be held in Buenos Aires in 1944.

After referring Dr. Carrea's letter to the State Department of the United States Government and receiving encouragement for such participation on the part of American dentistry, I took the matter up directly with the President of the Association, Wilfred H. Robinson. Dr. Robinson stated that he had been thinking along similar lines and that he would present the matter to the Board of Trustees at the February meeting (1941).

As a result, in February, Dr. Robinson asked me to accept the chairmanship of a committee to be known as the Pan American Relations Committee. He asked me to work out plans to facilitate the exchange of dental knowledge among the Americas.

At first, this did not seem difficult, but, upon investigation, it was found that there was no authoritative information in the United States regarding the dental societies and organizations of Latin America. What information was available was unsatisfactory and, in many instances, inaccurate. Obviously, the first step necessary was to secure a correct list of all the dental societies, dental schools and dental journals in Latin America. This was done with the cooperation of the United States Department of State and the representatives of the Latin American republics located in Washington. The lists secured from these sources were checked against each other and then verified by direct communication with each of the societies, schools and journals. This complete and accurate list is now available from the files of the American Dental Association. One of the main responsibilities of this committee during the past year has been to keep this list up to date and accurate. This has required considerable time and much correspondence.

In consultation with Dr. Robinson, it was decided to devote one day of the Houston Meeting to honoring our colleagues from Latin America. This day was designated as "Pan American Day." Invitations were sent to all of the Latin American dental societies, requesting them to send representatives and clinicians. Because of the high cost of travel and the fact that the invitations were late in being sent, as a result of the difficulties involved in obtaining an accurate mailing list, not many acceptances were expected, but the gesture of good will was considered of great importance for its effect on future negotiations. The Committee sponsored a successful lunch-

*This report is to be presented to the Board of Trustees and the House of Delegates at St. Louis, August 24, for official action.—Ed.

eon at the Houston Meeting, which was attended by 165 persons, fifty-seven of whom were Mexicans. Many congratulatory letters have been received from Latin American friends on the importance of this initial gesture.

Throughout the past year, the committee, through its chairman, has been active in consulting with the Coordinator of Inter-American Affairs and with the Division of Cultural Relations of the State Department. But these groups are of the opinion that the American Dental Association can do much good in furthering the national policy of our government.

Last March, the American Society of Orthodontists sponsored and held the First Inter-American Orthodontic Congress, which was highly successful. At least one orthodontist from each Latin American country, except Colombia, was in attendance at the sessions held in New Orleans and those held the following week at the Army Dental College at Walter Reed Medical Center in Washington, D. C. About twelve of the men remained after April 1 to attend postgraduate instruction at the Kellogg Foundation of the University of Michigan, as guests of the foundation. The American Society of Orthodontists received a grant of money from the Office of the Coordinator of Inter-American Affairs to help underwrite a share of the expenses of the Congress. This recognition of dentistry shows the importance attached to our profession by the Government. The president of the American Society of Orthodontists and chairman of the congress is a member of the Pan American Relations Committee of the American Dental Association.

The Council on Dental Education of the American Dental Association, at the suggestion of this committee, sent complimentary copies of the book, "Dentistry as a Professional Career" to the deans of all of the Latin American dental schools. This gesture is bound to have good results.

The work of this committee has been divided into sections and the members have been given specific duties. All have shown enthusiasm and willingness to cooperate in the work of the committee. The members of the committee and the work each has undertaken are as follows:

Spencer R. Atkinson: Report of scholarships offered by dental schools of the United States to Latin American dental students and study of plans for traveling dental caravan to lecture in South American cities.

Don J. Aubertine: Formulation of plans for the distribution of modern scientific dental films in Latin America.

Ralph H. Brodsky: Report of scholarships offered by the Pan American Odontological Association to Latin American dental students.

James R. Cameron: Report of dental internships at hospitals available to Latin American dental graduates.

C. J. Caraballo: Translation of letters and literature received from Latin America.

W. T. Foster: Advisor and translator.

A. F. Jackson: Compilation of list of Spanish and Portuguese speaking dentists in the United States.

Walter T. McFall: Registration of Latin American guests at the Annual Meeting.

Walter T. Newton: Advisor on program.

Clarence E. Peterson: Local arrangements for Pan American Day at the Annual Meeting.

J. M. Renedo: History of Latin American dental movement in North America.

Edward J. Ryan: Advisor on dental articles offered for publication in the United States.

Fernando Sacasa: Compilation of list of Latin American dentists who have studied in the U. S. dental schools; radio broadcasts.

Alfred S. Walker: Report of dentistry's relation to the Pan American Medical Association.

Claude R. Wood: Report on First Inter-American Orthodontic Congress.

One of the important works accomplished is the compiling of a list of dentists in the United States who speak Spanish or Portuguese. This list now contains more than 500 names, and it is hoped to enlarge it during the coming year. All dentists who speak Spanish or Portuguese should communicate with the chairman, Daniel F. Lynch, or with Andrew F. Jackson, of Philadelphia, so that they may be included on the list. These men may be needed as interpreters at the national meetings, or they may be asked to assist in the translation of important documents and letters received from Latin America.

Don J. Aubertine, of San Francisco, has done splendid work in cooperation with Cecil C. Connelly, of St. Louis, in reviewing the motion picture field. It is hoped to secure at least five of the best films shown and have copies made to send to each of the Latin American countries as a gift from the American dental profession. Negotiations are under way to have the expense of this project underwritten by the Division of Cultural Relations of the State Department, or by the Coordinator of Inter-American Affairs.

The field of dental journalism in Latin America is receiving greater attention than ever before. The Journal Committee of the Board of Trustees has been presented with the problem of whether the American Dental Association shall take an active and material interest in this field. The only North American dental journal which is published in Spanish and circularized in Latin America is the Spanish edition of *Oral Hygiene,* which has been in existence for twelve years. This journal has done good work in Latin America, and, at the present time, its publishing company has an application for financial assistance filed in the Office of the Coordinator of Inter-American Affairs, so that the journal may be improved and circularized more extensively.

Another of the important ways in which the Latin American dentist may become familiar with the work done in the United States is studying at our dental schools. Most of the United States dental schools offer some type of scholarship to foreign students and, in a few instances, specific scholarships are granted to Latin American students. This committee is, at present, engaged in gathering all possible information concerning these scholarships so that a booklet on the subject can be published and circularized throughout Latin America. Such a pamphlet is necessary if this information is to be made readily available, so that all scholarships offered can be compared and publicized.

When the committee was first organized, it was found that many individual dentists and dental organizations in various parts of this country had been actively interested in Latin America for a number of years. The work of these individuals and groups has been carefully studied, and every effort has been made to give them assistance and encouragement. It has been the desire of this committee to coordinate all these efforts and to encourage the groups and individuals so that each and everyone would know what the other was doing. By following this policy, the American Dental Association becomes the source of all information regarding Latin American movements in dentistry. This is as it should be, for the Government and other agencies naturally turn to the national dental organization for information on dental affairs. Previously to the formation of this committee, the American Dental Association did not have any organized source of information. The

Central Office took care of such matters as best it could and did a good job, but it was not in a position to do all the work necessary for the successful handling of this important field of activities.

During the past year, a package of important pamphlets, dealing with information on the activities of the American Dental Association and of the U. S. Government in relation to the Latin American countries was sent to all of the dental societies, schools and journals of Latin America, at the expense of the American Dental Association. Many letters of appreciation have been received, and it is expected that the good effects of this action will increase. The package contained the following items.

1. Charter, Constitutional and Administrative By-Laws and Code of Ethics of the American Dental Association, 1939.
2. The Bureau of Public Relations, American Dental Association, List of Dental Educational Material, Winter, 1941-1942.
3. Official Exchange of Professors, Teachers, and Graduate Students Under the Convention for the Promotion of Inter-American Cultural Relations, 1941.
4. Treaty Series, No. 928, Inter-American Cultural Relations, Convention Between the United States of America and Other American Republics, 1938.
5. Recent Developments with Regard to the Convention for the Promotion of Inter-American Cultural Relations.
6. The Program of the Department of State in Cultural Relations, 1940-1941.
7. The Value of Language Study.
8. Regulations Regarding Travel Rate Reductions for Students and Teachers.
9. List of Publications Regarding Cultural Relations Available upon Request from the Department of State.
10. List of Technical Films of the American Dental Association.

Letters of invitation have been sent to all of the Latin American dental societies, inviting their members to come to the Annual Meeting and participate in the proceedings. All of the Section Chairmen of the American Dental Association have shown a desire to cooperate in their willingness to have Latin American essayists on the program. Last year in Houston, there were four Latin Americans on the scientific program.

The handling of personal correspondence is one of the important phases of the work of this committee. Several letters are received every day by the chairman, from persons from Latin America, asking for all sorts of information. In each instance, they are answered immediately and as courteously as possible, and not only the information requested but any other that may be pertinent and of value is supplied. Postage is one of the items of greatest expense, since most mail must go by air. To depend on regular mail under ordinary circumstances is unsatisfactory, and at present there is added the uncertainty of delivery due to war. Delivery of a letter to Buenos Aires, Argentina, by ordinary post takes three or four weeks. When the letter is sent by air, this time is cut to less than a week. The advantage of rapid communication in our work cannot be overemphasized.

The suggestion by Juan Ubaldo Carrea that the American Dental Association participate in the Fifth Dental Congress of the Federación Odontológica Latino Americana (F.O.L.A.) in Buenos Aires in 1944 should receive careful study and action by the American Dental Association. The chairman of this committee has investigated informally the advantages of cooperation with the F.O.L.A. and believes the American Dental Association should accept the formal invitation of the Federación when it is presented. The Canadian Dental Association has been approached on the subject, both by your chairman and by Dr. Carrea, and I believe they are willing to cooperate with the F.O.L.A. in its fifth dental congress. If the American Dental Association and the Canadian Dental Association should attend this congress in

1944, as guests, plans for the formation of an Inter-American dental federation or Pan American dental federation, whichever name seems appropriate, can be made. There will be no expense involved in accepting the invitation for attendance at the Congress by either the American Dental Association or the Canadian Dental Association. But if, after attendance, it seemed desirable to hold future congresses, both North American associations would be expected to enter into active cooperation in their management. These matters could be studied first hand by a special committee appointed by the American Dental Association to attend the Fifth Dental Congress in Buenos Aires in 1944. Future action of the American Dental Association could be formulated upon the observations and recommendations of this committee. It is suggested, therefore, that the American Dental Association appoint such a committee, or instruct the Pan American Relations Committee to carry on this work and cooperate actively with the F.O.L.A. between now and 1944, when the congress will be held.

Last August 1941, your chairman made a trip through South America, visiting and lecturing before the national dental associations of the following countries: Uruguay, Argentina, Chile and Peru. The leaders and officials of the dental societies in Brazil and Panama were also visited. The greetings and salutations of the President of the American Dental Association were extended to each of the presidents of the dental societies visited and the work of the American Dental Association and its Pan American Relations Committee was explained. Everywhere, sincere expressions of appreciation of our work were received, together with an expression of hope that the American Dental Association would continue to expand its activities with regard to Latin America.

At the present time, with the assistance of the Coordinator's Office of Inter-American Affairs, plans are under way to secure facilities for broadcasting dental programs to Latin America. This work is being directed by Fernando Sacasa, a member of this committee. The broadcasts will be in Spanish and will be concerned with current and official dental information from the American Dental Association.

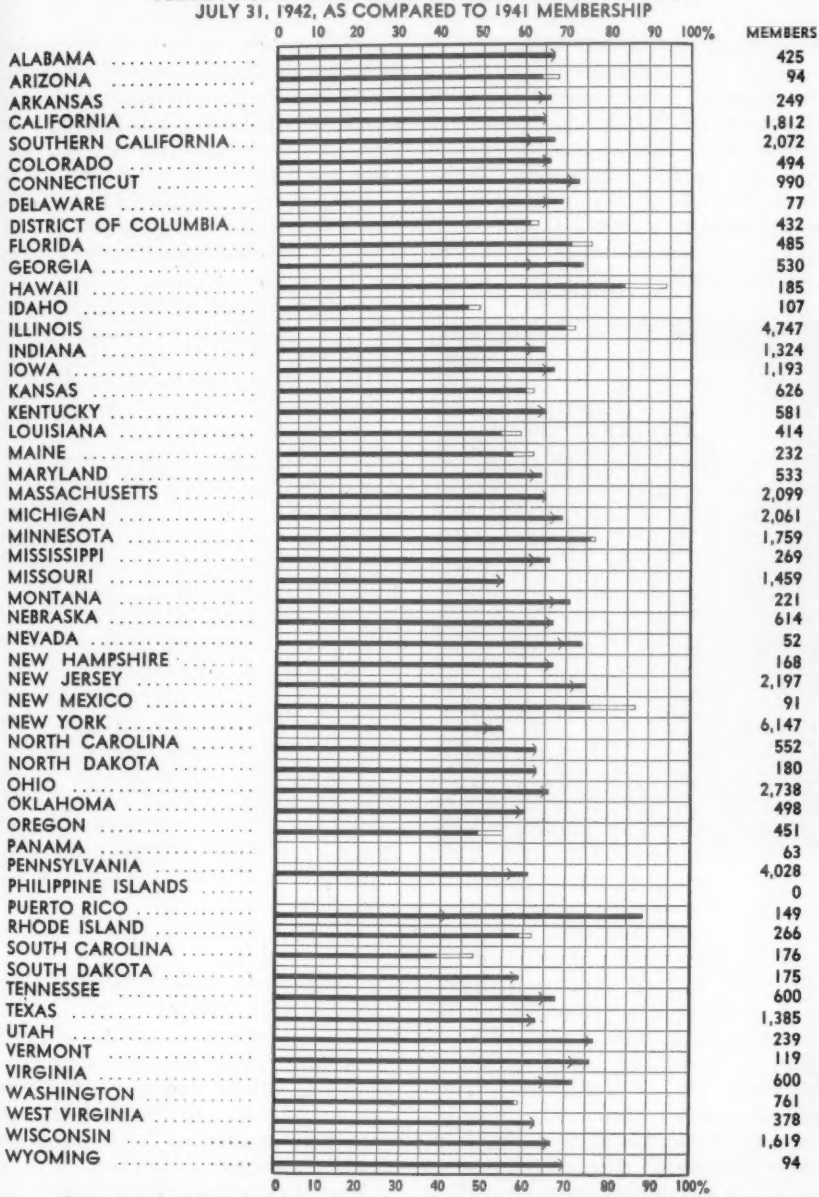
The work of the Pan American Relations Committee must necessarily move slowly, but there is every reason to believe that, as the years pass, its importance will grow and its influence on the national policy of our country will be significant. Its effect on American dentistry will be beneficial, stimulating and satisfying.

Respectfully submitted,

DANIEL F. LYNCH, *Chairman.*

# Membership Page

PERCENTAGE OF DUES RECEIVED IN CENTRAL OFFICE AS OF JULY 31, 1942, AS COMPARED TO 1941 MEMBERSHIP




Percentage based on dental population figures supplied by the State Society Secretaries.

1942 percentage. 1941 percentage.

# OBITUARIES

## COM. W. C. TROJAKOWSKI, D.D.S.
1898-1942

COMMANDER WADSWORTH CAESAR TROJAKOWSKI, DC, U. S. Navy, was killed in action May 8, 1942, during the Coral Sea battle. Commander Trojakowski was caring for casualties in the forward dressing station on the U. S. S. *Lexington* when the blast came that caused his death.

W. C. TROJAKOWSKI, D.D.S.
1898-1942

Dr. Trojakowski was born in Schenectady, N. Y., in 1898. He attended school in that city until his enlistment in the Navy during the first World War. At the time, he was 17 and a member of the senior class of Nott Terrace High School. Leaving the service to study dentistry, he graduated from the Baltimore College of Dental Surgery in 1923. For a year, he practiced in New Britain, Conn. In July 1924, he qualified by examination as lieutenant (junior grade) in the Dental Corps of the Navy. After being commissioned, he studied at Columbia University. His first duty in service was in the Marine Barracks, Quantico, Va.

In 1929, Dr. Trojakowski was promoted to lieutenant senior grade. During this year, he saw service with the Marine Expenditionary Brigade in Managua, Nicaragua. Returning to the United States in 1929, he was assigned to the U. S. Naval Hospital, Great Lakes, Ill. His next tour of duty was in the U. S. S. *Beaver*. From that duty, he was ordered to the Asiatic Station, where he served in Hankow, China. In 1937, he was the dental surgeon in the U. S. Naval Hospital, Brooklyn, where he was on duty at the time of his promotion to the rank of Lieutenant Commander in the Dental Corps. He made a sea cruise in the U. S. S. *Mississippi* in 1939. Two years later, he was on shore duty in Puget Sound Navy Yard, Bremerton, Wash. From that station, he was assigned to the *Lexington*. In January 1942, he was made Commander.

Commander Trojakowski was one of the outstanding members of the Navy Dental Corps and was held in high regard by the officers and men who were his shipmates in many stations in many parts of the world.

J. B. R.

## CARL J. GROVE, D.D.S.
1873-1942

CARL J. GROVE, son of Martin and Mary Grove, was born on a farm near Milleville, Minn., June 19, 1873. He died at his home in St. Paul, July 4, 1942, of complications following an attack of pneumonia in March.

After his preliminary education in Southern Minnesota, he went to Val-

paraiso University, where he graduated from the school of pharmacy in 1896. Here, he roomed with John P. Buckley, and the two of them later went to Chicago where they studied dentistry at the Chicago College of Dental Surgery, graduating in 1898.

After spending a few years practicing in southern Minnesota, Dr. Grove settled in St. Paul, in 1904, where he practiced until his death. For the past fifteen years, he had been associated with his son in the practice of dentistry.

CARL J. GROVE, D.D.S.
1873-1942

Dr. Grove was one of the early students of dental histopathology as it pertained to root-canal therapy and he contributed greatly to this branch of dentistry. He was the first to call attention to the fact that the periodontal membrane folded into the foramen and to its ability to form secondary cementum; a fact on which modern successful root-canal therapy is based.

Aside from his research work, Dr. Grove was interested in all branches of dentistry and their development. In recent years, with his son, he had worked in the field of the chemistry of saliva in relation to dental caries.

He was interested in nutrition and its application in dentistry and for more than three years was editor of *Nutrition and Dental Health*.

Dr. Grove was an active member of the American Dental Association; a life member of the St. Paul District Dental Society, and the Minnesota State Dental Association, and an early member of the International Association for Dental Research. He was a Fellow of the American College of Dentists and the International College of Dentists and a member of Delta Sigma Delta and Omicron Kappa Epsilon fraternities. He belonged to the Ancient Landmark Lodge, A. F. & A. M. and Osman Temple of the Mystic Shrine.

Surviving are his wife, Loula B. Grove, and his son, Carl T. Grove, two brothers, Dr. A. F. Grove and Dr. G. N. Grove, and one sister, Mrs. R. R. Fiske.

## JAMES W. DEATON, D.D.S., F.A.C.D.
1886-1942

JAMES WESLEY DEATON was born on a ranch near San Antonio, Texas, February 5, 1886. He died July 14, 1942, at his home in Texarkana, Ark.

Dr. Deaton was a graduate of the Dental Department, St. Louis University, class of 1914, and was in active practice at the time of his last illness. He was a past president of the Arkansas State Dental Association (1924). He had also been a member of the Arkansas State Board of Dental Examiners for the past thirteen years, serving as its vice president the last eight years. He was a member of the American Dental Association and component bodies and the Full Denture Society, and was made a Fellow of the American College of Dentists in 1938.

Dr. Deaton lived a full and useful life. Blessed with an almost overwhelming practice, he still found time to give a full measure of his energy to any worthwhile cause, particularly if it related to dentistry. Much of the progress of dentistry in Arkansas can be attributed to his untiring efforts.

Wit and humor flowed in a never ending stream from his jovial nature. His bodily frame of generous proportion but typified an equally generous heart within. No one will ever know the many acts of kindness he did for those less fortunate. His charities were never bestowed for the purpose of ostentation, but were motivated solely by a kindly and grateful heart. He was esteemed by prince and pauper alike. He was a friend to all, and all were friends to him. He was at home in any environment.

The profession has lost a great dentist. We who knew him and loved him have lost a great friend.

Truly, he believed and practiced the philosophy that "Life is not a goblet to be drained, but a measure to be filled."

CLARENCE W. KOCH.

# QUESTIONS AND ANSWERS

**The answers here published have been prepared by authorities, but do not represent the opinion of the American Dental Association as an organization or of any other official bodies unless specifically stated in the reply.**

## ORAL HYGIENISTS

***To the Editor:*** 1. According to the accepted standards of the American Dental Association, what professional limitations exist relative to the duties of the oral hygienist in the dental office?

2. Briefly outline them as a guide for the dentist desiring to employ an oral hygienist in his office of general practice.

### ANSWER

1. The American Dental Association has not adopted any standards which limit or regulate the activities of oral hygienists. Such limitations as exist are imposed by the state laws which authorize the granting of licenses to hygienists. These laws differ from each other in some respects, but, in general, are fairly uniform.

2. Space does not permit an outline of all of the thirty-five laws regulating the practice of oral hygiene. The following provisions of the New York law relative to the scope of activity of oral hygienists are fairly typical of most states:

Where hygienist may work: Any licensed dentist, public institution or school authorities may employ such licensed and registered dental hygienists. They may operate in the office of any licensed dentist or in any public institution or in the schools under the general direction or supervision of a licensed dentist, but nothing herein shall be construed as authorizing any dental hygienist to perform any operation in the mouth without supervision.

Scope of work: "They may remove lime deposits, secretions and stains from exposed surfaces of the teeth, but shall not perform any other operation on the teeth or tissues of the mouth."

S. R. L.

# INCIDENTS OF PRACTICE

## Bilaterally Embedded Maxillary Cuspids and Bicuspids: Report of a Case

By K. L. Dedekind, D.D.S., Salt Lake City, Utah

*History.*—October 21, 1941, R. S., a robust white man, aged 23, weight 163 pounds, suffered a blow on the mouth while working among livestock on his ranch.

The blow dislocated and fractured the four maxillary incisors and comminuted the supporting process.

The teeth were removed and the bone smoothed so as to afford a symmetrical ridge. This operation was done under nitrous oxide gas anesthesia and the patient was dismissed. Recovery was uneventful.

Figure 1.

After removal of the sutures, the patient was referred to a prosthodontist for consultation. The clinical appearance of the mouth suggested the advisability of a detailed roentgenologic study.

*Examination.*—X-ray examination revealed bilaterally embedded cuspids and first bicuspids with resorbed deciduous cuspids overlying the crowns of the embedded bicuspids. (Figs. 1-2.)

For both prosthetic and financial reasons it was decided to remove the remaining ten teeth as well as the four that were embedded.

*Operation.*—December, 3, under nitrous oxide anesthesia, the four embedded teeth were removed palatally, and the ten other teeth were extracted. A modified alveolectomy was performed and sulfathiazole-benzocaine ointment was inserted in the palatal wounds. The mucosa was sutured with black silk.

*Postoperative Results.*—As the patient lived a long distance from town, he was unable to come in for postoperative observation and was not seen until December 9. On December 8, he had been removed to the hospital for an emergency appendectomy, and it was while he was convalescing that the sutures were removed, December 10. Recovery from both operations was uneventful and the patient is now waiting completion of an artificial denture.

Figure 2.

*Comment.*—This case is reported as being of interest since the literature in the American Dental Association Library reports numerous cases of embedded cuspids, but does not record any instances in which both cuspids and bicuspids were embedded bilaterally.

805 Medical Arts Building.

# CURRENT LITERATURE

## Dental Caries Control in Everday Practice

By PHELPS J. MURPHEY

Up to the present time, we have not had an answer to the question, "Can dental caries be controlled?" The voluminous material at hand must be summed up in order to apply our knowledge, taken from the research of Miller, Bunting, Snyder, Jay, Becks and others, and to derive from it a mode of practical application.

A definite routine has been developed, including food intake analysis, obtaining saliva specimens, bacteriologic procedures and calculation of food elements, with mineral salt and vitamin determinations.

A corrective diet is supplied which gives adequate caloric intake and optimum mineral salts and vitamins, as well as reduction of carbohydrates and increase of protein and fat, all of which is based on sound nutritional principles.

Additional saliva specimens are obtained at intervals after corrective diet is followed to check up on the possibilities of dental caries susceptibility. A recheck of the patient's cooperation is possible and the complete procedure can be applied in every day practice. There is abundant supporting evidence based on results obtained in 130 cases over a period of two years.—*Texas D. J.*, **60**:181, March-June 1942.

## Economic Aspects of Dental Practice

By ALBERT W. HILLER

THE intelligent application of good business principles to a dental practice is in perfect harmony with the code of ethics of the American Dental Association. Money is as necessary in the exchange of services as speech is in the exchange of ideas. We can serve only within the limits imposed by our financial restrictions.

The high points of a comprehensive system of economics: As to the character of the man, he has self-confidence based on knowledge, not conceit based on vanity. A correct use of the system eliminates lost motion. Successful presentation of services safeguards him against selling gold restorations to someone having an amalgam income. Time is valuable because the average yearly productive hours are only one thousand. A collection plan should collect and not offend, erecting a satisfactory credit structure. Credit standing is not to be confused with social standing. Cost accounting, an accurate record of time involved, soon shows when the dentist is operating at a loss, and gives him courage to ask a just, profitable fee predicted on costs, not on emotion or guesswork. The highest type of dentistry should carry with it a fee that liberates the mind from worry.—*Texas D. J.*, **60**:82, March-June 1942.

## Newer Uses and Limitations of Acrylic Resins in Fillings and Crown and Bridge Prosthesis

By S. D. TYLMAN

SHRINKAGE of objects molded of acrylic resins under ordinary manufacturing conditions is five one thousandths inch per inch of molded section. The Bureau of Standards shows that the linear shrinkage of acrylic resins varies from 0.47 to 0.56 inch, and occurs on the processing of the acrylic resin by the methods generally employed in dental offices. To compensate for shrinkage, a new technic was employed calling for an electro-deposited copper die over which the acrylic crown or inlay was constructed. In an experiment to determine accuracy of fit, it was found that crowns made on electroplated dies could be seated accurately. Crowns made on amalgam dies covered with one thousandth inch tinfoil were less accurate; while those made directly over cement dies were least accurate.

The amount of water absorption of acrylics varies from 0.5 per cent by weight to 3 per cent. Tests conducted at the Bureau

of Standards indicate that acrylic resin dentures which were stabilized at a constant, relative humidity of 32 per cent expanded approximately 0.8 per cent within twenty-seven days when placed in water. The same denture shrank below original dimensions when exposed to the air. The problem remains as to whether inlays should reach saturation expansion before cementing or should be cemented when dry, relying upon subsequent expansion to secure greater retention.

The limitations of acrylics for bridges and other prostheses should be recognized. When an acrylic bridge is under stress, deformation, either temporary or permanent, occurs. Because of this, it is suggested that a method of metallic structural reinforcement be employed in all cases of bridge prosthesis.—*Ann. Dent.*, 1:10, June 1942.

GLEN FOOR.

## Prevention and Control of Oral Diseases by a Specific Organotherapy

By A. REISSNER

THE author believes that endogenous factors play a more important rôle than exogenous factors in dental decay. Local conditions such as bacterial invasion, accumulation of food residues, sugar intake, carbohydrate fermentation and unfavorable salivary conditions are considered of secondary importance.

Administration of a tissue extract prepared from the jaws and teeth of very young animals (preferably embryos) intravenously, intramuscularly, subcutaneously and submucosally, improved or cured pathologic conditions in dogs and human beings. It is claimed that by means of this organotherapy, dental hypersensitivity can be cured. The acute form of caries is arrested, the lesion becoming dry and less progressive. Extensive hypoplasia is ameliorated. The discolored dentin changes from a dark brown to yellow and approaches white. The hypoplastic surfaces become smooth, while the dentin hardens. In fractures, bone regeneration and callus formation are accelerated. The destructive process in osteomyelitis rapidly becomes circumscribed and arrested, with rapid new bone formation. Loosened pyorrheic teeth become firm. Bleeding and pus formation stop. Loosened gingivae readhere firmly to the necks of the teeth. The circulation of the gums is regulated so that they show a natural redness again.

The preparation comes in two forms: an albumin free fluid in ampules, and tablets. The dosage depends on age, general constitution and severity of the case. The average dose consists of 20-30 injections three times weekly in the submucous alveolar fold of either jaw, together with 200-300 tablets. The most effective results are obtained from a combined treatment of injections and tablets.—*D. Items Int.*, 64:618, July 1942.

PETER P. DALE.

## Treatment for the Teeth Grinding Habit

By E. MATTHEWS

THE method of treatment outlined for teeth grinding is very simple and inexpensive. A thoroughly dry plaster model of one of the arches is dipped into rubber latex and then placed in an oven, preferably at 65 or 70° C., and allowed to remain until the latex has become clear. This may be repeated until the deposit has reached the desired thickness. The finished product should fit the jaw perfectly, and, if properly used, should eliminate the teeth-grinding habit in nervous patients.—*D. Rec.*, 42:154, June 1942.

V. H. POWELL.

## Hyperplasia of Gums Due to Dilantin Sodium

By F. E. SMITH

A WOMAN, aged 26, who had received dilantin sodium for the treatment of epilepsy since May 1939 began to complain of gingivitis in February, 1940. Two years later, gross hyperplasia of the maxillary gingivae was evident. The gums appeared nodular and were firm, hard and pink with no tendency to hemorrhage and with no great discomfort except where the growth of interdental papillae made mastication painful. The case is not entirely typical since the gums of both jaws are usually affected. The fact that there was absence of hemorrhage and that antiscorbutic treatment did not cure or prevent the disease disproves the suggestion that scurvy might have been the cause. Furthermore, microscopically, the mucosa shows an increase in collagen fibers, while in scurvy there is a decrease in these fibers.

It is suggested that careful oral hygiene may prevent the overgrowth when the drug is first administered. However, when hyperplasia has occurred, the drug may be continued provided dental irritation and infections are eliminated and gingivectomy is performed. There may be a recurrence unless the drug is discontinued.—*Brit. D. J.*, 72:303, June 15, 1942.

V. H. POWELL.

## Autoprophylaxis as a Preventive for the Recurrence of Periodontoclasia

By M. RAYBIN

A THOROUGH and inexpensive method of keeping the teeth clean and cleanable requires cotton rolls and a porte polisher, with which the teeth, gums, and tongue are cleaned twice daily, night and morning. The existing pockets are expanded by means of guttapercha points and all the accessible areas are carefully cleaned. At least once a week, the patient uses soft wood polishers to remove all calculus and render the tooth surfaces smooth. The stimulation and massage derived from the proper use of cotton and wood points has been shown, over a period of thirty years, to delay pyorrhea.—*D. Outlook* 29:305, July 1942.

V. H. POWELL.

## Herpes Simplex Virus

By A. J. STEIGMAN and T. F. MCNAIR SCOTT

THE virus of herpes simplex can easily be isolated from human beings by inoculation of the suspected material on the scarified cornea of a rabbit. A positive reaction consists of a definite keratoconjunctivitis with redness and thickening of the nictitating membrane, often accompanied by a purulent exudate. Both the exudate and the nictitating membrane are bacteriologically sterile. After the reaction is well established, usually from thirty-six to forty-eight hours after inoculation, the nictitating membrane is removed with aseptic precautions and is emulsified with sterile alundum and a physiologic saline solution in a mortar and pestle. After centrifugation to remove coarse particles, the supernatant is inoculated in 0.0250.03 cc. amounts, intracerebrally in mice. Herpetic encephalitis results after a varying inoculation period, which may be as long as ten days on first passage, but usually decreases to three or four days after brain-to-brain passage has been frequently repeated. Culture of the emulsified material on blood-agar plates is bacteriologically sterile except for occasional obviously adventitious contaminants.

It has been possible, with this method, to induce herpetic encephalitis in mice from ten consecutive rabbits infected with different strains of herpes virus obtained from the saliva of human cases of primary herpetic stomatitis.—*Lancet.* 1:761, June 27, 1942.

V. H. POWELL.

## Effect of Low Calcium and Vitamin D-Deficient Diet on Bones and Teeth of Mature Rats

By A. P. LUND and W. D. ARMSTRONG

TWENTY male albino rats that had been raised to the age of 11 months on an adequate stock diet were fed for five weeks on a control diet containing 0.462 per cent calcium, 0.458 per cent phosphorus and adequate vitamin D. Ten of the animals were then transferred to the experimental diet, which was deficient in vitamin D and contained 0.007 per cent calcium and 0.450 per cent phosphorus. Calcium and phosphorus balances were determined for each animal over ten-day periods for 220 days. The animals of the control group remained in positive calcium and phosphorus balance throughout the study. The animals fed the deficient diet exhibited a severely negative calcium balance and a positive phosphorus balance.

The humeri, femora and the molar and incisor teeth were dissected free of soft tissue, cleaned, dried, rendered fat-free by continuous extraction with fat solvents and ashed. In the control animals, the alveolar bone was well calcified and the crest normal and the teeth were firmly fixed in their sockets. In the experimental rats, the alveolar bone was soft and friable, the alveolar crest was resorbed and the teeth were loosened. The average weight of dry fat-free incisor teeth of the two groups was not significantly different. Further results indicate that determinations upon the long bones reported in terms of weight per hundred cubic centi-

meters do not serve to distinguish osteoporotic from normal bone, but that the degree of osteoporosis can be described in terms of mineral content related to unit volume of bone. Both mineral and organic phases seem to be proportionally decreased in the osteoporotic bone.

Calcium and phosphorus analyses made on dentin indicated that no mineral had been lost by the molar teeth of the experimental animals. The composition of the dentin of the incisor teeth, which had been completely reformed several times during the period of observation, was not significantly different in the two groups of animals.—*Proc. Soc. Exper. Biol. & Med.*, 50:363, June 1942.

J. E. GILDA.

## Lactic Acid Fermentation of Streptococci

By P. A. SMITH and J. M. SHERMAN

THE lactic acid production of all the better known species of streptococci, both aerobic and anaerobic, was studied. An attempt was made to determine whether all types of streptococci were strictly homofermentative when glucose is utilized under anaerobic conditions, and whether all species produced the same amount of lactic acid.

There was no appreciable difference in yield between those tests made under anaerobic conditions and those made aerobically. The average percentage of lactic acid from glucose fermented by each group of streptococci tested ranged between 81.8 and 99.6.—*J. Bact.*, 43:725, June 1942.

GLEN FOOR.

## A Seriologic Classification of Viridans Streptococci with Special Reference to Those Isolated from Subacute Bacterial Endocarditis

By M. SOLOWEY

AN attempt was made to identify the potential pathogens among the saprophytic forms of *Streptococcus viridans*. A total of 108 strains of *Streptococcus viridans* from subacute bacterial endocarditis and ninety-nine strains from human throats and extracted abscessed teeth were studied. Two thirds of all the strains were differentiated into a number of seriologic groups. That 50 per cent of the reacting strains fell into two groups was considered evidence of the similarity of strains. More than three-fourths of the strains from both sources were *Streptococcus salivarius*, as determined by Sherman's biochemical criteria. No relation between a biochemical and a serologic classification could be made. The potential pathogens of various viridans strains were not determined. It was also impossible to indicate a serologic difference between strains of *Streptococcus viridans* isolated from subacute bacterial endocarditis and those isolated from human throats and extracted teeth.—*J. Exper. Med.*, 76:109, July 1942.

CHARLES RESEVICK.

## Statistical Analysis of the Incidence of Nutrient Channels and Foramina in Five Hundred Periapical Full-Mouth Radiodontic Examinations

By A. P. S. SWEET

THE incidence of nutrient channels and foramina in the mandible and maxilla, as revealed roentgenographically in 500 consecutive full-mouth periapical examinations is indicated. The author has shown by means of illustrations and tables that the incidence is nearly the same in females and males and on the right and left sides of individuals. Nutrient channels and foramina are more readily seen as the age increases. The author concludes that greater care should be exercised in the interpretation of dental roentgenograms to avoid mistaking nutrient channels and foramina for areas of pathosis, especially in examining roentgenograms of edentulous mouths and of older individuals. —*Am. J. Orthodontics*, 28:427, July 1942.

FRANK W. ARCHIBALD.

## Local Use of Sulfonamide Drugs

By E. E. OSGOOD

INVESTIGATIONS utilizing the marrow culture technic showed that, in saturated solutions, sulfathiazole and sulfanilamide are superior to sulfapyridine and sulfadiazine, and that sulfathiazole is much less toxic to living human cells in this concentration than is sulfanilamide. It was observed that none of these drugs is very effective against large numbers of organisms in any concentration attainable. Procaine hydrochloride and para-aminobenzoic acid inhibit the action of the sulfonamide drugs.

Local therapy for prophylaxis is indicated whenever there is a break in continuity of the skin or mucous membrane in a minimally infected or potentially infected area. Local therapy for the control of infection is indicated whenever there are a large number of pyogenic organisms present at one site. Of the compounds now available for local therapy, powdered sulfathiazole seems to be the drug of choice. Administration of sulfathiazole, neo-arsphenamine or sulfadiazine to maintain adequate blood levels before operation eliminates the contraindication to early operation; namely, the dissemination of small numbers of organisms into the blood stream or into the adjacent tissues. It was also shown that surgical drainage and rinsing with a saturated solution of sulfathiazole in a physiologic saline solution temporarily reduces the number of organisms so that local application of sulfathiazole powder may prove effective. Enough of the powdered drug should be applied to maintain the saturated concentration for at least seventy-two hours.—*Surg., Gynec. & Obst.*, 75:21, July 1942.

F. W. ARCHIBALD.

## Eruption of Deciduous Teeth

By M. ROBINOW, T. W. RICHARDS and M. ANDERSON

THE eruption age of 1,980 deciduous teeth was studied in a group of presumably normal, healthy white children. Teeth were considered erupted as soon as part of the crown had pierced the gum. The means, standard deviations and coefficients of variability were calculated for boys and for girls. Boys were slightly advanced as compared to girls in the eruption of all teeth except the first molars. The eruption of all teeth was more variable in girls than in boys. The lateral incisors were most variable in their eruption in both sexes. Eruption times of the ten tooth pairs were intercorrelated and subjected to centroid factor analysis. Three factors were obtained, two of which were considered significant. The appearance of ossification centers, height and onset of walking show little relation to the two factors. Therefore, it was concluded that neither of the dentition factors is a general growth or maturity factor and that dentition is a relatively independent growth process. The high communalities obtained mean that the variability of any tooth pair is accounted for largely by its correlation with the other teeth. Eruption depends comparatively little on conditions unique for any individual tooth pair.—*Growth*, 6:127, June 1942.

J. E. GILDA.

## Pathology of Artificially Induced Scurvy in the Monkey with or Without Calcium Deficiency

By T. H. TOMLINSON, JR.

VITAMIN C deficient monkeys showed marked hyperemia and hypertrophy of the gingiva, and separation of the soft tissues from the alveolar bone in areas of subperiosteal hemorrhage. Sections of the jaws gave evidence of hemorrhage about the tooth sockets with marked extension into the adjacent structures, causing the teeth to become loosened. Areas of the free gingiva were completely destroyed by necrosis. The alveolar bone plates were thin, showing marked resorption.

Calcium deficient monkeys showed no significant oral lesions.

Animals on a combined vitamin C and calcium deficient diet showed the characteristic gross and microscopic changes of the vitamin C deficient group. However, the lesions in this group were not so severe as those in the monkeys on a vitamin C diet alone.—*Pub. Health Rep.*, 57:987, July 3, 1942.

R. HILDEBRAND.

## Mouth Lesions in Monkeys Associated with a Chronic Deficiency of (1) Calcium, (2) Vitamin C and (3) Both Calcium and Vitamin C

By H. F. FRASER and N. H. TOPPING

*MACACUS RHESUS* monkeys on a control diet gave no evidence of gingivitis or periodontal disease. Seventy-five per cent of the animals on the calcium deficient diet likewise showed no symptoms of periodontal disease. All animals on a vitamin-C deficient diet, either alone or combined with a calcium deficiency, manifested extensive oral lesions. The initial lesions appeared much later in the mouths of animals on a combined calcium and vitamin C deficient

diet than lesions in the mouths of monkeys on a vitamin-C deficient diet only. The lesions in animals on a vitamin-C deficient diet were more extensive than the lesions in animals on a combined calcium and vitamin-C deficient diet.

After relatively advanced symptoms developed, each animal was given 30 mg. of vitamin C, injected intramuscularly. Such symptoms as hemorrhagic gingivitis, accumulation of food and débris and foul odor disappeared. However, there was no replacement of necrotic interdental papillae nor was there a tendency to reattachment of the separated gingiva. Many changes that occurred in lesions which had advanced to the stage of necrosis did not respond to therapy. —*Pub. Health Rep.*, 51:968, June 26, 1942.

R. HILDEBRAND.

## Function of the Lower Jaw Following Partial Resection

By F. YOUNG

EIGHT cases of partial resection of the mandible were thoroughly reviewed by the author. In seven cases, resection was performed extra-orally, while one case was intra-oral. The indication for extensive resection of the mandible was usually the invasion of the bone by direct extension of a carcinoma arising in the mucous membrane, or the occurrence of primary malignancy of the bone itself. From these cases, it was concluded that either the ramus or the body of the lower jaw, or both, can be removed without seriously impairing the function of the jaw. If, on the other hand, the symphysis region is excised, great disturbance in function results, unless the bone loss is repaired. Also, if a considerable amount of soft tissue and mucosa is removed along with the resected bone, functional disability ensues. This can be prevented by repair of the mucosal loss without bone replacement.—*Surgery*, 11:966, June 1942.

F. W. ARCHIBALD.

## Place of Pedodontics in Dental Education

By GEORGE W. TEUSCHER

The greatest hope for prevention of oral disease lies in the early education of the child in those habits of mouth care which will prevent disease and preserve the organs of his mouth. It is the responsibility of dental education to train the dental student to such a degree and in such a way that he can render adequate service to the child and can recognize the impact of child care on society.

To accomplish such training, dental education must see to it that the student becomes acquainted with the characteristics of the deciduous and the young permanent teeth. Further, he must learn to recognize the relationship of the pressure habits and of loss of teeth to malocclusion. Also, the student must become acquainted with the important relationships of the health of the hard and soft tissues to the fields of diet and nutrition, and growth and development.

With the growing emphasis on prevention and control, the child offers the best avenue of approach to a solution of the profession's major problems: prevention or control of dental caries and gingivitis.—*Northwest. Univ. Bull.*, Spring Issue, 1942, pp. 5-7.

## Rôle of the Orthodontist in Child Health

By P. M. DUNN

ORTHODONTICS helps to prevent disease in children by providing adequate masticatory machinery and thus aiding digestion and nutrition; by minimizing opportunities for the development of caries and pyorrhea; by reducing, in some instances, a tendency to upper respiratory complaints, and by contributing to mental hygiene through the improvement of personal appearance. Orthodontics promotes the growth of the facial bones and muscles and corrects defects already in existence, notably narrowing of the dental arches, malrelationship of the opposing dental arches and malposition of the teeth.

The orthodontist tries to promote the normal growth of living tissue. If normal growth is prevented or arrested by the fact that the system as a whole is not functioning properly, the orthodontist needs to know this fact. He is justified, at least in certain instances, in requesting a thorough examination of the child by the physician previous to orthodontic treatment, since, in order that such treatment may be successful, it may be necessary that metabolic balance be established, normal respiration be restored and harmful habits be discontinued.—*Minneapolis Dist. D. J.*

# ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

## CALENDAR OF MEETINGS

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF ORAL DIAGNOSIS, Boston, Mass., November 12-13.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE (DENTAL SUBSECTION), New York, December 28.

AMERICAN ASSOCIATION OF ORTHODONTISTS, Chicago, May 3-6, 1943.

AMERICAN DIETETIC ASSOCIATION, Detroit, Mich., October 19-22.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY, New York, N. Y., October 26.

CHICAGO DENTAL SOCIETY, February 22-25, 1943.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month, from October to June at the United States Public Health Service Auditorium, Washington.

MONTREAL (CANADA) DENTAL CLUB FALL DENTAL CLINIC, September 23-25.

GREATER NEW YORK DENTAL MEETING, New York, December 7-11.

NEW YORK SOCIETY FOR ORAL DIAGNOSIS, New York, September 16.

NEW YORK SOCIETY OF ORTHODONTISTS, New York, November 9-10.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA, Pittsburgh, November 3-5.

PACIFIC COAST SOCIETY OF ORTHODONTISTS, San Francisco, Calif., February 22-24, 1943.

## STATE SOCIETIES

September

Southern California, at Los Angeles (14-16)

November

Florida, at Tampa (9-11)
Ohio, at Cincinnati (9-11)

## STATE BOARDS OF DENTAL EXAMINERS

California, at San Francisco, February 15 and April 19, and at Los Angeles, March 22. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Connecticut, at Hartford, November 17-21. Clarence G. Brooks, New London, Recorder.

New Jersey, September 15-19. Walter A. Wilson, 150 E. State St., Trenton, Secretary.

Ohio, at Columbus, October 19. Earl D. Lowry, 79 E. State St., Columbus, Secretary.

Wisconsin, at Milwaukee, October 5-9. Stephen F. Donovan, Tomah, Secretary.

## AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF ORAL DIAGNOSIS

THE ninth annual congress of the American Association for the Advancemtnt of Oral Diagnosis will be held in Boston, November 12-13, at the Forsyth Dental Infirmary. The subject of this year's congress will be "The Military Aspects of Oral Diagnosis." Members of the medical and dental professions in the United States and countries of the Western Hemisphere who are interested are invited to attend and can obtain programs by addressing H. Justin Ross, 515 Madison Ave., New York, N. Y.

SHIRLEY DERAAY, *Executive Secretary.*

## AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE Dental Subsection of the American Association for the Advancement of Science will meet in New York December 28. The committee in charge of the meeting is composed of Arthur H. Merritt, William J. Gies and Paul C. Kitchin. There will be a symposium on "Dental Aspects of the Focal Infection Theory." Dentists and physicians are welcome.

PAUL C. KITCHIN, *Secretary,*
College of Dentistry,
Ohio State University,
Columbus.

## AMERICAN ASSOCIATION OF ORTHODONTISTS

THE next meeting of the American Association of Orthodontists will be held at the Edgewater Beach Hotel, Chicago, May 3-6, 1943.

MAX E. ERNST, *Secretary,*
1250 Lowry Medical Arts Bldg.,
St. Paul, Minn.

## AMERICAN DIETETIC ASSOCIATION

THE American Dietetic Association will hold its twenty-fifth annual meeting at the Hotel Statler, Detroit, Mich., October 19-22. All of the sessions of this meeting are planned to provide the dietitian with the greatest possible aid in playing her part under the difficult circumstances imposed by the war. Plans for increasing the number of trained dietitians available for Army service as well as for civilian service will be discussed. The best methods of teaching nutrition to the public and the most effective means whereby the dietetic profession can be of help to the Red Cross will be studied at this meeting. Ways of helping the dietitian to serve most effectively in hospitals, schools and industrial cafeterias will also be studied. Many key people in state and local groups are planning to attend this meeting. They are asked to bring their contributions for planning future action. It is also expected that they will take note of information available in prepared papers and round table discussions which they can disseminate to those dietitians in their local groups who are unable to attend.

## AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

THE fall meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held October 26 at the Midston House, Thirty-Eighth St. and Madison Avenue, New York, at 8:30 p.m. The president, James R. Cameron, of Philadelphia, will preside. Adolph A. Walkling, associate professor of surgery, Jefferson Medical College, Philadelphia, will read a paper on anesthesia of choice in injuries and infections of the head and neck. Tracheotomy procedure will be demonstrated with lantern slides.

M. HILLEL FELDMAN, *Secretary,*
730 Fifth Ave.,
New York.

## CHICAGO DENTAL SOCIETY MIDWINTER MEETING

THE 1943 Midwinter Meeting of the Chicago Dental Society will be held at the Palmer House, February 22-25.

HAROLD W. OPPICE, *Secretary.*

## MONTREAL FALL CLINIC

THE Montreal Dental Club will hold its fourth wartime fall clinic (eighteenth annual fall clinic) September 23-25 in the Mount Royal Hotel, Montreal. A program of papers, clinics and demonstrations has been arranged by the committee and an invitation is extended to all ethical practitioners. The preliminary program will be available about September 1, and any one desiring a program is requested to communicate with M. L. Donigan, 1414 Drummond St., Montreal. Registration fee, including two luncheons, is $10 for residents, $5 for nonresidents.

M. L. DONIGAN, *Director.*

## GREATER NEW YORK DENTAL MEETING

THE next Greater New York Dental Meeting will be held in the Hotel Pennsylvania, New York, December 7-11.

WALTER A. QUINN, *Chairman,*
Press and Publication.

## NEW YORK SOCIETY FOR ORAL DIAGNOSIS

THE New York Society for Oral Diagnosis, a component of the American Dental Association for the Advancement of Oral Diagnosis, will hold its first fall meeting September 16 at Squibb Hall, Squibb Building, 745 Fifth Ave., New York, at 8:30 p.m. The subject of the meeting will be "Diagnosis of Manifestations of Systemic Diseases in the Oral Cavity." A clinic on the anatomy of the temporomandibular articulation with the aid of wet specimens will be given after the lectures. Members of the medical and dental professions are invited.

H. JUSTIN ROSS, *Secretary,*
515 Madison Ave.,
New York.

## NEW YORK SOCIETY OF ORTHODONTISTS

THE next meeting of the New York Soci-

ety of Orthodontists will be held at the Waldorf-Astoria Hotel, New York, November 9-10.

NORMAN L. HILLYER, *Secretary,*
Professional Bldg.,
Hempstead.

### ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

THE Odontological Society of Western Pennsylvania will hold its sixty-first annual fall meeting Novmber 3-5 in the William Penn Hotel, Pittsburgh.

M. H. SMITH, *Office Secretary.*

### PACIFIC COAST SOCIETY OF ORTHODONTISTS

THE next meeting of the Pacific Coast Society of Orthodontists will be held in San Francisco February 22-24, 1943.

EARL F. LUSSIER, *Secretary,*
450 Sutter Bldg.,
San Francisco.

### PSI OMEGA FRATERNITY

THE National Alumni Chapter of the Psi Omego Fraternity desires to announce that, owing to the postponement of the Annual Meeting of the American Dental Association, and desiring to cooperate in matters of national defense, the Chapter has voted to cancel its proposed meeting activities August 24-25.

GERALD A. MITCHELL, *Grandmaster,*
GORDON L. TEALL, *Secretary.*

### SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Southern California State Dental Association will be held at the Los Angeles Biltmore Hotel, September 14-16.

ROBERT L. BORLAND, *Secretary,*
602 Chapman Bldg.,
Los Angeles.

### FLORIDA STATE DENTAL SOCIETY

THE next annual meeting of the Florida State Dental Society will be held at Tampa, November 9-11.

W. P. WOOD, JR., *Secretary,*
442 W. Lafayette St.,
Tampa.

### OHIO STATE DENTAL SOCIETY

THE next annual meeting of the Ohio State Dental Society will be held at the Netherland-Plaza Hotel, Cincinnati, November 9-11

EDWARD C. MILLS, *Secretary,*
255 E. Broad St.,
Columbus.

### BOARD OF DENTAL EXAMINERS OF CALIFORNIA

THE next examinations to be conducted by the Board of Dental Examiners of California for a license to practice dentistry and for a license to practice dental hygiene in California, will be held in San Francisco, commencing on February 15, 1943, in Los Angeles, commencing on March 22, 1943, and again in San Francisco commencing on April 19, 1943. All credentials must be in the office of the Secretary, Room 203, 515 Van Ness Avenue, San Francisco, at least twenty days prior to the date of the examinations. Address all communications to Kenneth I. Nesbitt, Secretary, Room 203, 515 Van Ness Avenue, San Francisco.

### CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford, November 17-21, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to Clarence G. Brooks, Recorder, New London.

### NEW JERSEY STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY

THE State Board of Registration and Examination in Dentistry in New Jersey will hold its next examinations, commencing September 15 and continuing for four days. The following spring examinations will be held commencing April 4, 1943, and continuing for five days. Upon application to the secretary, a copy of the requirements and rules, instruction sheet and preliminary application will be sent. Any person desiring to apply as a candidate must file the preliminary application blank, together with the examination fee of $25, on or before

February 15 for the succeeding April examinations and before August 15 for the succeeding September examinations.

WALTER A. WILSON, *Secretary,*
150 E. State St.,
Trenton, N. J.

## OHIO STATE DENTAL BOARD

THE October Examination of the Ohio State Dental Board will be held at Ohio State University College of Dentistry, Columbus, the week beginning October 19. All applications must be in the hands of the secretary at least ten days before the examination. For further information, apply to Earl D. Lowry, Secretary, 79 E. State St., Columbus.

## STATE OF WISCONSIN BOARD OF DENTAL EXAMINERS

THE State of Wisconsin Board of Examiners will hold its next examination at Marquette Dental School, Milwaukee, October 5-9. Examinations will be given for licensure of dentists and hygienists. All applications must be in by September 29. For application blanks and information, address

STEPHEN F. DONOVAN, *Secretary,*
Tomah.

## LOCATIONS FOR DENTISTS

A NEED for additional dentists exists in many of the vital defense areas. These shortages have arisen because of the great increase in civilian population that has occurred during the year. At present, needs exist in a number of states in communities varying in size from small villages to large cities. A continuing increase in population will result in overtaxing the dental personnel in many other localities where at present the dentists are very near the limit of their capacities. In many of these defense areas, there are defense housing projects in which office space or living accommodations, or both, may be secured. The United States Public Health Service, in cooperation with the Division of Defense Housing of the Federal Works Agency, which supervises these projects, is interested in acquainting dentists with the needs of these communities. If you are interested in securing more specific information about localities for the establishment of practice, communicate with

THOMAS PARRAN, *Surgeon General.*

## DENTAL RESIDENCY

THE University of Oregon Medical School Hospitals and Clinics offers a residency in dental medicine and oral surgery, the period of service to be one year, with compensation $40 monthly, in addition to board, room and laundry. The division is under the general direction of the department of medicine and the direct supervision of the head of the division and a visiting staff of sixteen dentists. Service is carried on in the outpatient clinic and the three hospitals. Application blanks will be furnished on request. Direct inquiries to

RICHARD B. DILLEHUNT, *Dean,*
University of Oregon Medical School,
Portland.

## RESEARCH FELLOWSHIP IN MEDICINE AND DENTISTRY AT THE UNIVERSITY OF ILLINOIS

THE Graduate School of the University of Illinois has established four research fellowships to be awarded for one year in the fields of medicine and dentistry in Chicago at a stipend of $1,200 per year (calendar year with one month's vacation). Candidates for these fellowships must have completed a training of not less than eight years beyond high school graduation. This training may have been acquired in any one of the following ways, or the equivalent thereof: 1. Work leading to the B.S. and M.D. degrees. 2. Work leading to the B.S., M.S., and D.D.S. degrees. 3. Work leading to the B.S. and B.A. degrees in a four-year collegiate course and to the D.D.S degree. 4. Work leading to the B.S., D.D.S. and M.D. degrees. The fellowship year begins September 1. Formal application blanks can be secured from the Secretary of the Committee on Graduate Work in Medicine and Dentistry, 1853 W. Polk St., Chicago, Ill.

## CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation of the New York and the Eastman Dental Clinic, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to

dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Fellow in Dentistry and, according to his interest, works as a graduate student in one of the departments of the medical schools. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maitnained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Applications should be made to

GEORGE H. WHIPPLE, *Dean,*
School of Medicine and Dentistry,
Rochester, N. Y.

## NEW YORK UNIVERSITY COLLEGE OF DENTISTRY POSTGRADUATE COURSE

THE New York University of Dentistry announces a postgraduate course in inhalation anesthesia, with special emphasis on nitrous oxide-oxygen anesthesia, conducted by E. A. Rovenstine, professor of anesthesia, N. Y. U. College of Medicine and Bellevue Hospital, and A. S. Mecca, assistant professor of oral surgery, N. Y. U. College of Dentistry and Bellevue Hospital. The course will be given on Friday mornings October 2 to November 6 inclusive. Direct all communications to the office of the dean, N. Y. U. Dental College, 209 E. 23rd St., New York, N. Y.

## COLUMBIA UNIVERSITY SCHOOL OF DENTAL AND ORAL SURGERY REFRESHER COURSES

COLUMBIA University School of Dental and Oral Surgery offers a short course in periodontia for qualified graduates in dentistry September 18, 1942, to January 15, 1943.

A ten-day intensive course will include lectures, discussions, demonstrations and clinical practice. An extended course, one half day per week for two sessions, will include lectures, discussions and supervised technical treatment. Both courses will be conducted by Frank E. Beube, Isador Hirshfeld, Harold J. Leonard (executive officer) and Arthur H. Merritt.

The courses given at the School of Dental and Oral Surgery, Columbia University, are designed to be "refresher" courses; i.e., to bring practitioners abreast of modern undergraduate teaching in theory and practice in the subject. Admission to the course is limited to qualified graduates in dentistry who are members in good standing of the American Dental Association or recognized sectional organizations. In the case of foreign applicants, membership in the applicant's national dental organization is required.

Information can be obtained from the registrar, School of Dental and Oral Surgery, 630 West 168th Street, New York, N. Y.

## THE MOUNT SINAI HOSPITAL NEW YORK CITY TWELFTH LECTURE COURSE IN DENTAL MEDICINE SEASON OF 1942-1943

October 20; Solon S. Bernstein: New Concepts of Dental Infection and Systemic Disease.

November 17; Harry A. Goldberg: Prostatitis and Multiple Arthritis of Dental Origin Discussed by William H. Mencher, M.D.

December 15: Presentation of cases by the medical and dental staff.

January 19; Jerome H. Kohn: Care of the Child, with Special Reference to Dentition and Nutrition.

February 16; Emanuel Schoenbach: Bacteriology, with Special Reference to Dental-Medical Problems.

March 16; Bernard Sussman: Superior and Inferior Impression Technic as Developed in the Mount Sinai Hospital Dental Department.

April 20; Presentation of cases by the dental staff.

All lectures will start promptly at 8:30 p.m. and will be held in the lecture room on the third floor of the Administration Building. There will be a presentation of clinical cases before each lecture. All physicians and dentists are invited.

HARRY A. GOLDBERG,
*Attending Dentist.*